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HANDBOOK ON THE VARIABLE MAGNETIC FIELD OF THE USSR

Spravochnik po peremennomu magnitnomu polyu SSR [Handbook on the Variable Magnetic Field of the USSR], 1954, Leningrad, Pages 3-267

V. I. Afanas'yeva

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FOREWORD

The Spravochnik po peremennomu magnitnomu polyu SSSR which is offered to the attention of the reader is the first publication of this type, and naturally, is not free of shortcomings. In a relatively small space, the editor of the handbook has tried to give in graphic and tabular form the factual information about all the basic phenomena of the variable magnetic field. The sources of this information are the results of observations made by the magnetic observatories of the USSR. Up to now the observations of the magnetic observatories of the USSR were published in the form of annuals of the magnetic observatories. These annuals as a rule contained tables of the average hourly values of the magnetic elements, observed in the observatories (magnetic inclination, horizontal and vertical components of the earth's magnetic field intensity), tables of daily magnetic variations (average for each month, and also averaged for the year and for the seasons) and certain other data (average monthly and average annual values of the magnetic elements, data on the magnetic activity, etc). The annuals, as their names indicated, contained usually the results of observations for a single year only made in one (sometimes several) magnetic observatories. This alone prevented the inclusion of data concerning many phenomena in the annuals. As a result, persons interested in such magnetic phenomena as cyclic magnetic variations (variations in the so-called 11-year cycle, connected with the activity of the sun), annual variations, regular components of the fields of magnetic storms, etc, or else persons interested in the geographic distribution of some magnetic phenomenon could not find the necessary material in the individual annual. It was necessary to either turn to the periodical literature or to assemble a series of annuals and from them select the suitable data.

In recent years (after 1936) the majority of magnetic observatories of the USSR stopped publishing annuals, primarily because it was admitted that it is not advantageous to publish observation materials from the magnetic observatories in the former form, which is of little interest to a large circle of readers.

Recently operating in the USSR territory are more than 15 magnetic observatories, i.e., approximately 1/4 of all the world's magnetic observatories (Figure 1). The territory of the USSR is so large that the data of these observatories offer ideas concerning the geographic distributions of many phenomena of the variable magnetic field of the earth. This is why the material is presented in this manual, wherever possible, in such a way as to permit judging the basic geographic laws governing these phenomena.

Since it is known at the present time that the variations connected with the cyclical changes in the activity of the sun (11-year variations) have the longest period of all the reliably established types of magnetic time variations, the handbook is made up principally from observation materials covering 11 years -- from 1938 through 1948. The choice of this particular 11-year interval is justified from the following considerations: starting in 1937, the Main Geophysical Observatory changed the nature of the operation of the magnetic observatory in Pavlovsk. The Pavlovsk magnetic observatory has reinforced sharply the scientific-methodic management of all the magnetic observatories of the hydrometeorological service. Starting in 1940, a Scientific Research Institute for Terrestrial Magnetism was organized in the hydrometeorological service. This raised even more the level of the scientific-methodic management of local observatories, and also contributed to the further equipping of many local magnetic observatories by second sets of variation magnetic instruments. As a result, the observation materials obtained by the magnetic observatories of the hydrometeorological service since 1937-1938 should be considered as more reliable in quality than similar materials obtained for the preceding years. Therefore, since we desired to base the handbook on not less than an 11-year series of observations, it was not deemed advantageous to take an 11-year series that covers years prior to 1938. On the other hand, since the work on the compilation of this handbook started in 1950 it was not advantageous to discard data for 1938 and start the 11-year series with 1939, since the materials for 1949 were still not fully processed in 1950.

A certain disadvantage of the adopted 11-year interval starting with 1938 through 1948 is admittedly the fact that this interval does not coincide with one 11-year cycle of solar activity. In fact, the year in which the solar activity is a minimum is 1944, which does not occur at the start of the time interval covered by this handbook, but is the seventh year of this interval. Therefore, the material of the handbook covers years of 2 successive maxima of solar activity (1938 and 1947) and the intermediate years of low activity (1943-1944), rather than a single natural solar-activity cycle. However, the compilers of the handbook, owing to the circumstances listed above, did not have the opportunity to select another time interval, for which data could be included in the handbook. It should also be noted that even though the years 1938-1948 include the years of the Great Fatherland War, the magnetic observatories of the USSR were in continuous operation during this period and obtained quite reliable observation materials. The data of the observatories of the northern latitudes of the USSR (observatories under the jurisdiction of the Main Administration of the Northern Sea Lanes) are used in the handbook only for several individual years, sometimes even not pertaining to the above-mentioned 1938-1948 period, owing to the fact that by the time the handbook was compiled no finished processed observation materials were obtained from these observatories for several years.

Table 1 shows the data from which observatories and from which years were employed in the handbook.

(Note: The data from the L'vov magnetic observatory (L'vov State University) were not used in the handbook.)

The material of the handbook is contained in an introduction and in 7 chapters.

The introduction contains some quite general information concerning the magnetic field of the earth: and such information is intended for a reader who is not acquainted with the special literature on terrestrial magnetism. It will do no harm for the reader who is sufficiently acquainted with the general concepts of terrestrial magnetism to skip the introduction and turn directly to the chapter of the handbook of interest to him.

We list below the 7 chapters of the handbook.

I. Cyclical Geomagnetic Variations. These variations, based on data from only one 11-year interval, cannot be determined with sufficient reliability. They are therefore given in the handbook not from data for 1938-194 , but for a longer interval of years, but the data are obtained from a smaller number of observatories.

II. Long-Period Geomagnetic Variations. This name is given to variations the period of which is nearly 2 years. Attention was first called to this type of variation in the domestic literature only a few years ago, and it was resolved that since the value of these variations is of the same order of magnitude as the value of the formerly employed annual variations, it is necessary to devote one of the chapters of the handbook to this new type of variation.

III. Annual Geomagnetic Variations. The Soviet geophysicists are responsible for many of the most important results of investigation of these long-known variations. The handbook gives annual variations that were first computed by a method, published in the Soviet literature in recent years (2), an methodicall the most correct.

IV. Solar-daily Geomagnetic Variations. A suitably large space has been devoted in the handbook to this type of variation, which is employed with particular frequency in many practical problems.

The daily variations re given for the years in which the magnetic activity was high and for those in which it was low. Average values for the cycle are also given. In addition to the daily variations for days in which the magnetic activity is low (quiet days), daily variations are also given for days with increased magnetic activity (disturbed days).

V. Disturbed Geomagnetic Variations. These variations, being one of 2 regular parts of the field of magnetic storms, are represented in the handbook only for the years in which the magnetic activity was high and for those in which it was low, for no separate practical corrections have yet been made for this type of variation by means of magnetic measurements.

VI. A periodic Geomagnetic Storm-Time Variations. Unfortunately, this variation is sometimes still called in the domestic literature 'storm-taym' variation" which is the untranslated English name of these variations transliterated into Russian. The author of this handbook chapter believes that the name here adopted represents what is most essential in this variation and is better than the name employed up to now. Most attention is paid in this chapter of the handbook to the aperiodic geomagnetic storm-time variations in the horizontal component, in which these variations have the most pronounced form. No separate corrections were introduced in practice for the aperiodic storm-time variations during time of storm resulting from measurements of the magnetic elements.

VII. Magnetic Activity. This chapter contains a summary catalogue of magnetic storms for 1938-1948, first compiled for the handbook, and containing information on each storm as measured by many observatories. The magnetic-storm catalogues published up to now contain information based on the data of only a single observatory. The summary catalogue makes it possible to follow many laws in the geographic distribution of the highest levels of

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magnetic activity, namely magnetic storms. The chapter contains summary tables for the most widely used characteristics of magnetic activity and results of their systematic investigation.

The compilers of the handbook first planned to include still another, eighth chapter, devoted to the practical application of the material collected in the first 7 chapters. This was abandoned when it became clear that compilation of such a chapter requires still more considerable time. Considering the need of publishing this type of handbook and the possibility of its practical use even without the eighth chapter, and not desiring to delay the publication of the handbook, the compilers decided to publish it in the scope described above, and the discussion of practical applications of the handbook material will be prepared and published separately.

It was decided by the editors of the handbook to employ isogram maps or geographic charts to show the geographic features of the magnetic phenomena represented. This method of representation appears better than the method of employing maps of the electric currents that are equivalent to the variations, widely used in recent years at the initiative of English and American geophysicists. It is known that the majority of electric-current systems, represented by maps, are merely effective systems, not existing in nature in pure form. In addition, the altitude of the currents over the surface of the earth is so far determined indirectly. The method of representing the variations by isograms is more graphic and simpler in all those cases when the reader is interested in the geographic distribution of the variations of a single geomagnetic element.

In making the decision as to the character of the references to the literature, it was decided that it is not advantageous to employ too many references. Since the principal task of the handbook is to systematize the factual data on magnetic variations, the references are limited to literature that also contains the systematization of observed data on variation. They do not include on the one hand theoretical work, and on the other publications similar to magnetic-observatory annuals, i.e., publications which contain factual data on variation but not in general form.

The following names and symbols are employed in this handbook for the elements of the geomagnetic field: declination (D), inclination (I), horizontal component (H), vertical component (Z) northern component (X), eastern component (Y), total intensity (F).

Unless otherwise mentioned, the variations of the declination and inclination are given as a rule in angular minutes, and the variations of all the other elements are given in gammas. One gamma is equal to 1/100,000 of the absolute unit (oersted) used in the measurement of the magnetic field intensity.

Participating in the compilation of the handbook were the scientific workers NIIZM [Nauchno-issledovatel'skiy institut zemnogo magnetizma -- Scientific-Research Institute of Terrestrial Magnetism] and several other scientific-research institutes of the hydrometeorological service.

The individual chapters of the handbook were prepared by the following persons.

I. Cyclical Geomagnetic Variations -- S. M. Kozik (Tashkent Scientific-Research Geophysical Observatory).

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II. Long-Period Geomagnetic Variations -- professor Yu. D. Kalinin (NIIZM).

III. Annual Geomagnetic Variations -- V. I. Afaras'yeva (NIIZM), candidate in physico-mathematical sciences.

IV. Solar-Daily Geomagnetic Variations -- M. S. Penkevich, candidate in physico-mathematical sciences, Ye. P. Glushkova, Z. S. Kuznetsova (GGO) [Glavnaya geofizicheskaya obervatoriya -- Main Geophysical Observatory].

(The above chapter was revised at the NIIZM. Material from polar observatories and the isogram maps were prepared by M. A. Belousova. The text of the chapter was revised by Yu. D. Kalinin.)

V. Disturbed Geomagnetic Variations -- M. A. Belousova (NIIZM).

VI. Aperiodic Storm-Time Geomagnetic Variations -- V. I. Afaras'yeva.

VII. Magnetic Activity -- V. I. Afaras'yeva (catalogue of storms and deductions), S. M. Kozik, and professor V. N. Mikhalkov (tables of characteristics of magnetic activity and statistics based on it).

The compilation of many chapters of the handbook became possible due to the fact that many workers in the local magnetic observatories of the hydrometeorological service have carried out a supplementary analysis of the observation materials and on their generalization, and have reported their results to the NIIZM. This work was performed by N. A. Katsiashvili in the Tbilisi Scientific Research Geophysical Observatory, M. A. Lipina in the

Sverdlovsk Observatory, under the direction of professor V. N. Mikhalkov in Tashkent, by I. N. Petrov and A. V. Timofeyev in the Yuzhno-Sakhalinsk Observatory, and by candidate in physico-mathematical science N. F. Pushkin the Kazan' magnetic observatory.

V. I. Afaras'yeva was the general editor of the handbook.

INTRODUCTION

At any point in space around the earth's surface it is possible to measure the natural magnetic field with suitable instruments. This field is called the terrestrial magnetic or geomagnetic field. At the present time much is known about this field. It was found that the principal portion of this field does not change noticeably with time but is independent of time. This portion of the field is called the permanent magnetic field of the earth. It also has been found that a relatively small portion of the terrestrial magnetic field, representing as a rule several thousandths of the entire field, varies continuously with time and depends on time. This portion of the field is called the variable magnetic field of the earth.

Like any other field, the earth's magnetic field can be fully described by indicating the magnitude and direction of the field for each point of space. It is customary in the study of the terrestrial magnetism to specify the field with the aid of the following elements: magnetic declination (horizontal plane angle at a given point, formed by the geographic meridian with the horizontal projection of the magnetic field intensity of the earth; the symbol for the magnetic declination is D); magnetic inclination (vertical plane angle at a given point, formed by the direction of the field intensity and its horizontal projection;

symbol I); the horizontal component (projection of the field strength on the horizontal plane at a given point; symbol H); vertical component (projection of the field strength on the vertical direction at a given point, symbol Z); northern component (projection of the horizontal component on the line of the geographic meridian at a given point, symbol X); eastern component (projection of the horizontal component on the line of the geographic latitude circle at a given point, symbol Y); and the total field strength (symbol F or T). The attached diagram (Figure 2) shows the mutual location of all the elements of the magnetic field. The various elements at any one point are always related by the following equations:

$$H = F\cos I; \quad Z = F\sin I; \quad X = H\cos D; \quad Y = H\sin D$$

and by the corrolaries of these equations:

$$H^2 + Z^2 = F^2$$

$$X^2 + Y^2 = H^2$$

$$X^2 + Y^2 + Z^2 = F^2$$

$$\mathrm{tg}I = Z/H$$

$$\mathrm{tg}D = Y/X$$

The declination D and the inclination I are measured in some sort of angular measure (most frequently in angular degrees, minutes, and seconds, assuming a right angle to be equal to 90 degrees); the total field intensity (F) and the components (H, Z, X, Y) are measured in oersteds or in gammas (one gamma = 1/100,000 oersted, symbol γ). The values of H and F are always considered positive, and with respect to the remaining elements it is assumed to assume the following values as positive: Z directed downward, X northward, and Y eastward; D corresponds to an angle measured from the geographic margin clockwise, I is positive when Z is positive. In all other cases, X, Y, Z, D, I are assumed to be negative.

The geographic distribution of the earth's permanent magnetic field is such that in first approximation to reality it can be assumed that this is the field of a uniformly-magnetized sphere.

At lower latitudes the permanent field is directed almost horizontally, and near the Arctic almost vertically downward, while in the Antarctic it is almost vertically upward. There are 2 regions in which the field is vertical, one is in the north of North America, the other in the Antarctic. These regions are called the principal magnetic poles of the earth. The field in the vicinity of the poles is approximately twice as large as in the vicinity of the earth's equator. However, such a description of the earth's magnetic field is only a very rough approximation of reality. A fuller concept of the permanent field is given by the magnetic maps, i.e., maps which show the isograms of the elements of the magnetic field. The most important in practice are the magnetic declination maps. The isograms of D, i.e., the lines connecting those places on the earth's surface in which the value of D is the same, are called isogons. The isograms of I are called isoclines, and the isograms of H, X, Y, Z, and F have the common name of isodynes.

The values of the magnetic elements on the earth's surface are measured basically (the sense of "basically" will become clear later) within the following limits: F -- from 0.24 to - 0.73 oersted, H -- from 0 to 0.41 oersted, Z -- from 0.62 to 0.73 oersted, X -- from 0 to 0.41 oersteds, Y -- from 0 to 0.15 oersted, D -- from 0 to ± 180°, and I -- from 90 to -90°.

As we move from one point on the earth's surface to another, the field elements vary gradually and relatively slowly. On the greatest portion of the earth's surface in middle latitudes a displacement of several hundredths of km corresponds to a change, for example, of one degree in D, 0.01 oersted in H, etc. The variation of D is greater at higher latitudes. However, there are many regions in which the field in space changes considerably more, and the changes, for example, in D amounting to tenths of degrees, can occur within several km and even hundreds and tens of m. These regions are generally called magnetic anomalies. The magnetic anomalies are classified by the sizes of the area they occupy and by the extent of the change in the field within the anomalies.

In certain anomalous regions the field may differ by a factor of 2 from the value that it should have in this region were there is no anomaly.

The most widely used method for representing data on the spatial distribution of the magnetic field is the concept of the geographic distribution of individual magnetic elements with the aid of magnetic maps.

Depending on their purpose, magnetic maps are compiled with varying degrees of detail. Those most representative of the actual state of affairs are called the maps of the normal magnetic field.

Mathematical analysis has shown that the permanent magnetic field of the earth originates within the earth. At the present time one no longer thinks, as in the past, that the substance within the earth is uniformly magnetized. The causes of the permanent magnetic field have 2 origins. The principal portion of the field (the uniform magnetization field) and the most extensive anomalies (world wide, occupying regions commensurate with the sizes of entire continents) are produced by electromagnetic processes occurring at very great depths within the earth (to the order of 3,000 to 4,000 km). The fields of the smaller magnetic anomalies (hundreds of km or less) are due to magnetic masses that are distributed with a great degree of nonuniformity in the upper layers of earth's crust. The strongest and at the same time the most limited in space are the anomalies produced by the protrusion of magnetic masses (iron ores) on the surface of the earth.

It is customary to divide the variable magnetic field into 2 principal parts: one contains the various changes with time that have a pronounced periodic character, and the other changes that do not have such a periodic character. Forming a group by themselves are slow variations in the permanent field, in regard to which we still do not know whether they are periodic or not; these are the so-called secular magnetic variations.

Mathematical analysis shows that all periodic variations are caused outside the earth's sphere. These variations are usually classified in accordance with the length of their period. Such a classification turns out simultaneously to be a classification by physical causes. We know of diurnal solar variations, the period of which lasts a day. These variations are caused by the daily rotation of the earth. Annual variations, lasting one calendar year, are known. These variations are caused by the rotation of the earth about the sun. There are lunar-daily variations, the period of which equals the lunar day. These variations are caused by the daily rotation of the earth relative to the moon.

Daily periodic variations are caused by the fact that the ultraviolet rays of the sun ionize the earth's atmosphere, producing in it layers that have a relatively large electric conductivity, and the tidal movement of the atmosphere causes this electrically-conducting layer to move in a definite manner in the earth's constant magnetic field. This explains the solar and lunar daily variations. In the former case the tidal movements are produced by the attraction of the sun, and in the second by the attraction of the moon. There is still no final idea concerning the nature of the annual variation, but apparently in this case the principal role is played by the ultraviolet rays of the sun, which change with an annual periodicity at every point of the earth's surface.

In addition to the ultraviolet and general wave radiation, the sun ejects into the space that surrounds streams of corpuscles, which are electrically charged particles. The interaction between these streams and the permanent magnetic field of the earth causes magnetic storms and a general magnetic activity. It is customary to distinguish in the field of magnetic storms a regular portion comprising 2 variations: a disturbed course of the storm and an aperiodic time variation of the storm.

The nonuniform distribution of the magnetic activity with time causes the so-called cyclic variation, i.e., the variations in the 11-year cycle.

The physical nature of the recently discovered "long-period" variations, lasting on the order of 2 years, is still not clear, but mathematical analysis indicates that these variations occur within the solid core of the earth's sphere.

Finally, what is known about the secular variations is that they originate definitely within the earth's sphere (the principal portion occurs most probably at great depth) and it is possible that their origin is closely related to the origin of the permanent magnetic field.

All component parts of the variable magnetic field, including the secular variations, can be characterized with the aid of a description of their geographic behavior.

This handbook contains such information as pertains to the territory of the USSR for all principal types of magnetic variation with time, excluding the lunar-daily variations, which are extremely small in their magnitude (not exceeding one gamma), and with the exception of the secular variations which usually do not belong, as was already indicated, to the variable magnetic field.

Information about the variable magnetic field is obtained principally as a result of the activities of the magnetic observatories, in which the values of the field at a given location are continuously recorded with the aid of special instruments -- magnetographs. At the present time there is a total of approximately 70 magnetic observatories in operation on the earth's sphere, including 19 that are lately in operation in the USSR.

The principal initial result of the activity of each of the magnetic observatories is a photographic film (magnetogram) containing a continuous record of the variation of magnetic elements with time. One usually records the variations of the elements D, H, and Z at the observatories. Unless 3 elements are recorded it is impossible to obtain a complete representation of the variable magnetic field.

Figures 3 and 4 give examples of magnetograms. Figure 3 shows the magnetogram of a so-called quiet day with respect to magnetic conditions, and Figure 4 is a magnetogram of a day that includes a magnetic storm. Somewhat more will be said below, in the corresponding chapters, concerning what is a quiet day and what is a magnetic storm.

More details concerning the permanent magnetic field and concerning the secular variations can be found in the special literature (23). Certain supplementary information on the nature of individual phenomena of the variable magnetic field, in addition to what has been said above, is given below in the corresponding chapters of the handbook.

CHAPTER I. CYCLIC GEOMAGNETIC VARIATIONS

The solar activity experiences fluctuations which, strictly speaking, can not be called periodic, but their average duration is approximately 11 years. These cyclic variations of solar activity affect many geophysical phenomena, including the earth's magnetic field. The latter exhibits cyclic geomagnetic variations, which parallel the 11-year fluctuations of the solar activity.

As was already mentioned, it is possible by means of mathematical theory to subdivide the geomagnetic field into 3 portions, one due only to internal causes, and the other only to external ones. However, the accuracy with which this subdivision is made is insufficient in practice for a study of cyclic variations, for the amplitudes of these variations are small. This is why all investigations of these variations were carried out by means of other methods.

The most widely used method for investigating cyclic variations is based on the assumption that the secular course is continuous. Such an assumption is natural, if the secular course is due to a displacement or to a change in the stage of large masses at a considerable depth under the surface of the earth; however, we can not have full assurance beforehand of the absence of breaks or sharp changes in the rate of the secular course. The method described replaces the physical feature of the internal origin of the secular trend by a formal continuity feature. In practice the matter reduces to fitting a certain smooth curve to a sufficiently long series of annual average values of some elements of the magnetic field at a given point. The average annual values are selected because they can be assumed free of annual and other short-period variations. The chosen smooth curve is most frequently expressed as an algebraic polynomial expressed in powers of time:

$$a_0 + a_1 t + a_2 t^2 + \ldots$$

whereby the number of terms is taken to be considerably less than the number of years in the selected series of observations. Having determined the coefficients of the polynomials, using the least-squares method, the resultant smooth curve is taken to represent the expression for the purely secular trend. Then the deviations of the observed annual average values from those calculated by means of the formula obtained should be considered as consisting of the cyclic variations, added to the random observation errors.

The weakest point in the method described is the choice of the degree of the polynomial and the number of its terms. The longer the series of observations and the more winding the secular trend, the larger is the number of terms required; but this general indication can not be expressed in the form of an actual guiding rule. If we take an insufficient number of terms, we obtain too coarse an approximation of the secular trend, and in this case a portion of the trend will turn out to be included in the deviations of the observations from the curve. On the contrary, if too large a number of terms is taken, it is possible to approximate the curve to the observation so closely, that it includes not only the secular trend, but also a considerable fraction of the long-period variations. In either case we do not obtain a proper separation of the component parts. The success depends to a considerable extent on the estimate of the observer and on his skill.

The second method is based on the fact that a regular periodic oscillation with constant amplitude vanishes if averaged over an interval the width of which equals the length of the period. If we smooth the series of observation by subtracting the averages in a sliding 11-year interval, we obtain a curve that contains no oscillations with an 11-year period; this oscillation will be fully included in the deviations of observations from the smooth curve. The same will occur with all its harmonics, i.e., with oscillations that have periods equal to 1/2, 1/3, 1/4, etc, of the interval. Oscillation having other periods do not disappear, but are only reduced and consequently are not fully included in the deviations from the curve. Oscillations with short periods, as well as short-time aperiodic oscillations and random errors are smoothed considerably and are therefore almost all included in the deviations. The secular trend, as a very slow oscillation, is hardly subjected to any smoothing when the sliding average is taken; the small deformation, that still occurs in this case, can be calculated and corrected for, as will be shown below. Thus, were only purely periodic (even though nonsinusoidal) oscillations with an 11-year period and constant amplitude to be superposed on the observed data on the secular trend, these oscillations could be separated completely by using the method of sliding 11-year averages. If upon such separation one observes that the secular trend contains variations with other periods, these variations can in turn be eliminated using a new average, taking a different sliding interval in accordance with the length of the observed period.

At the present time we know of no external causes, with the exception of solar activity, that could cause any cyclic variations in the terrestrial magnetism. Therefore, having no basis for expecting to find in these variations any other periods except the 11-year solar period, we restrict ourselves to averaging over an 11-year interval. Let us note, however, that even in this case when the solar activity is actually the only cause of cyclic magnetic variations, the sliding 11-year average method can not give perfect results, for the fluctuations in the solar activity are not strictly periodic: the activity is not the same in different 11-year cycles, and the length of the cycle also varies.

Let us call attention to still another shortcoming of the sliding-average method. Smoothing shortens the given series of observation by 5 years on each end (if the interval is 11 years), for each average relates to the mid-point of the averaging interval. It is therefore impossible to use short series of observations, and long series may lose much in the presence of gaps that do not lend themselves to interpolation. In spite of these shortcomings, the second method must be given preference over the first, since it is more objective.

The scheme for the computational processing employed in the sliding 11-year average method is such: given a series of annual-average values

$$u_1, u_2, u_3, \ldots u_n$$

We calculate successive sums in the sliding 11-year interval:

$$\sum_{1}^{11} u_i, \quad \sum_{2}^{12} u_i, \quad \sum_{3}^{13} u_i, \ldots, \quad \sum_{n-10}^{n} u_i$$

We relate the average to the central, i.e., sixth year of the interval:

$$\frac{1}{11} \sum_{k}^{k+10} u_i = u_{k+5}^{(1)}$$

The resultant series of averages

$$u_6^{(1)} \; u_7^{(1)} \; u_8^{(1)}, \ldots, u_{n-5}^{(1)}$$

represents in almost pure form the secular trend, only slightly distorted by the smoothing performed. To determine the value of this distortion we subject the resultant series to a second smoothing using the same sequence, namely, we form new sums and averages:

$$\frac{1}{11} \sum_{6}^{16} u_i^{(1)} = u_{11}^{(2)}; \quad \frac{1}{11} \sum_{7}^{17} u_i^{(1)} = u_{12}^{(2)}, \ldots,$$

$$\frac{1}{11} \sum_{n-15}^{n-5} u_i^{(1)} = u_{n-10}^{(2)}$$

The resultant series of twice smoothed averages is compared with the corresponding terms of the once-smoothed series. The differences $u_i^{(2)} - u_i^{(1)}$ represent the unknown distortion of the secular trend, due to the single smoothing. Subtracting them from the once-smoothed series, i.e., from the numbers $u_i^{(1)}$, we obtain the undistorted pure secular trend v_1;

$$v_{11} = 2u_{11}^{(1)} - u_{11}^{(2)};\ v_{12} = 2u_{12}^{(1)} - u_{12}^{(2)}, \ldots, v_{n-10} = 2u_{n-10}^{(1)} - u_{n-10}^{(2)}$$

Let us note that during the second averaging in the sliding 11-year interval we again lose 5 years on each end of the series. In general, we lose 20 years in the double smoothing. The course of the numbers $u^{(2)}$ is usually quite irregular, and can be extrapolated for 1 to 2 years without risking large errors; however, it is impossible to reduce the errors substantially.

Subtracting the resultant values v_1 from the observed u_1, we obtain as the residue the cyclic variations w_1 (including random observation errors):

$$w_i = u_i - v_i$$

An example of a complete processing using the sliding 11-year average method is given in Table 2. Tables 3, 4, 5, and 6 give cyclic variations calculated with the same method, using data from several magnetic observatories of the USSR for the 4 elements of the magnetic field: H, T, D, and Z.

Only prolonged series of observations, not less than 25 to 30 years, are suitable for determination of the cyclic variations and these observations must furthermore be uniform over the entire series. The uniformity of a series of observations depends on a reliable coordination of all its portion whenever instruments are changed in the observatories, whenever procedures and work programs are changed, and especially whenever the observatories are moved to new locations. Since the amplitudes of the cyclic variations are small, on the order of 10 to 20 gammas in the horizontal component, the necessary observation accuracy is quite high. Only 2 observatories, Leningrad and Sverdlovsk, meet these requirements, and that only since the 1880's. Earlier observations are too inaccurate. Sufficiently long series of observation are available also from 3 other observatories: Irkutsk, Kazan', and Tbilisi, but in other respects they are inferior to the 2 preceding ones. The Irkutsk and Kazan' series are insufficiently uniform, and the Tbilisi series has large gaps. The series from the remaining observatories are not sufficiently long; therefore, observations from these observatories were not used.

Let us note that the calculation of the cyclic variations makes possible obtaining a certain estimate of the quality of the processed results. The quantities represent, as was already mentioned, not only the cyclic variations, but also the random observation errors. If the latter are large, the w curve exhibits a considerable irregular sawtooth form, and the resultant amplitudes of the oscillations are exaggerated. A characteristic picture is also formed by the trend of the values of w if the difference in the values of any element of the magnetic field at the old and new location is inaccurately determined whenever the observatory is moved: for five years prior to the move the curve starts deviating to one side, and then deviates with a sharp jump to the opposite side, and gradually returns to the initial level during the subsequent 5 years.

Let us now examine the results obtained on individual elements of the magnetic field.

Cyclic Variations of the Horizontal Component

Attention is called to the close agreement between the cyclic variations of the horizontal component (Table 3) made at all the observatories, with the exception of Tbilisi. Particularly close

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is the parallelism of the Leningrad and Sverdlovsk curves. The tooth-like shape of the Kazan' curve, particularly noticeable prior to 1930, must be attributed to random errors: after supplementary smoothing, the curve exhibits closer agreement with the Leningrad and Sverdlovsk curves. The Irkutsk curve is in close agreement with the other curves over almost its entire extent, with the exception of the 1922-1924 section, at which it makes a pronounced downward dip, in contradiction with all the remaining curves. The Tbilisi curve has a large gap (1910-1925), and it is equally difficult to note agreement with curves from other observatories prior and after this gap. Only the 1891-1899 section exhibits a certain similarity. The large amplitude of the oscillations between 1900 and 1909 probably indicates an insufficient coordination between the absolute observations of H when the observations were transferred from Tbilisi to Karsani. After 1926, the signs of the changes from one year to another usually agree with the changes observed at other observatories, but the amplitudes of the fluctuations in Tbilisi are considerably smaller, as if the published annual average values of H were already slightly smoothed.

The agreement between the variations of H at the various observatories makes it possible to average the resultant values of w so as to reduce the random errors. Table 6 and Figure 5 show the average weighted result, obtained by taking the Leningrad and Sverdlovsk data with a weight of unity, the Irkutsk data with a weight of 0.5 starting with 1914 and a weight of 0.2 for earlier years, and taking the Kazan' data with a weight of 0.2 for all the time (whereby during 1909-1929 the values taken were first smoothed using the very simple equation $\bar{x}_2 = \frac{x_1+2x_2+x_3}{4}$). The Tbilisi data were not included in the calculation of the weighted averages. (Two years, 1913 and 1923, which violate strongly the agreement between the Irkutsk curve and the other curves, have been eliminated and replaced by averages for the 2 adjacent years.)

The averaged curve of the cyclic variations on the horizontal component is in undoubted agreement with the course of the sunspot-activity cycle, whereby an increased number of sunspots is accompanied by a smaller horizontal component, and a decreased number of sunspots is accompanied by an increase of the component. For convenience in comparison, the positive values of ΔH of Figure 5 are plotted not upward, but downward from the axis. There is no detailed agreement with the course of the number of spots, the latter being smoother. The coefficient of correlation between ΔH and W (the relative number of sunspots) is 0.72. As the relative number of spots is increased by 100 units, the horizontal component decreases by 14 gammas.

A closer agreement, particularly in the details, is observed between the cyclic variations of H and the magnetic activity (see Chapter VII concerning the magnetic activity). Thus, using the u-measure of the magnetic activity, the correlation with the variations of H is given by a coefficient of 0.78. Particularly noticeable is the identical double-humped form of both curves in 1892-1894, as contrasted with the single-humped maximum of the relative numbers. The regression of H per unit u-measure amounts to 19 gammas. The above figures pertain to the 63-year interval of time from 1897 through 1940. If the other, ball international characteristic of the magnetic activity (C) (for which we have data only since 1884) is used, the correlation with ΔH is not as close, viz., 0.68. But here too certain details agree with the course of the curve of ΔH. Worthy of attention is the peak of 1930, which is sharply marked only on the curve of the C characteristics, is barely noticeable in the u-measure and is absent from the relative numbers. The cyclic variations show a pronounced minimum in that year. The minimum of 1930 is not a limited local feature: not only the observatories of the USSR, but also the observatories of other countries all jointly confirm this detail in the course of the horizontal components. As a result of comparison of the ΔH curve with the curves of the relative numbers, the u-measure, and the C characteristics, it can be stated (in spite of the absence of an undisputed measure of magnetic activity) that the cyclic variations of the horizontal component follow closer the course of the geomagnetic activity than the number of sunspots. It is possible that with increased accuracy in the measurements of the magnetic field at the observatories the value of the cyclic variations of H will prove to be a good measure for the geomagnetic activity.

The amplitudes of the cyclic variations in different 11-year cycles are not the same. The weakest sunspot activity occurred within this time interval during the solar cycle 1901-1913. During the same time the amplitude of the cyclic magnetic variations was sharply reduced at all observatories. For other cycles, however, it is impossible to establish a distinct relationship between the amplitude of the cyclic variations and the intensity of the sunspot formation: the data from the various observatories are not in sufficiently good agreement between themselves to explain relatively small differences in intensity in the following cycles.

On the average, the 11-year fluctuations in the horizontal component for all the 63 years (almost 6 solar cycles) represent a simple wave of sufficiently regular form with an amplitude of approximately 12 gammas (Table 8 and Figure 6).

Let us also touch on the problem of the dependence of the amplitude of the variation ΔH on the local latitude. In view of the evident connection between the cyclic 11-years variations with the so-called "post perturbation" of the magnetic field, one would expect their amplitudes to increase with diminishing geomagnetic latitude (with the exception of the polar zone, where the dependence is more complicated). (The geomagnetic latitude is the latitude measured not from the geographic but from the geomagnetic equator. The geomagnetic equator is the great circle on the surface of the earth located 90^{o} away from the geomagnetic poles.) In fact, the amplitudes in Honolulu and in Dera-Duna are approximately twice as large as the amplitudes in Leningrad, Sverdlovsk, and Sitka. However, within the moderate latitudes in the territory of the USSR one does not see such an increase in amplitude southward; Leningrad, Sverdlovsk, Irkutsk, and Kazan' give almost equal amplitudes, and in Tbilisi the amplitudes are even smaller than at the northern observatories. Since the curve of variation of H in Tbilisi is generally in little agreement with the other curves, hardly anything can be seen from the small value of the Tbilisi amplitudes to indicate some local anomaly, and one should rather attribute it to random defects in observations or in methods of analysis. In general, in present-day measurement accuracy, from the measurements of the magnetic field it can be assumed that Table 6 represents sufficiently well the cyclic variations of the horizontal components for 1878-1940 over the entire territory of the USSR south of the sixtieth parallel.

For the last decade it is impossible to subtract the cyclic variations, using the method of the sliding 11-year averages described above, but it is possible to carry out approximate calculations using empirical equations employing the connection with the number of sunspots or with the magnetic activity

$$\Delta H = 5.4 - 0.14W$$

or

$$\Delta H = 22 - 13u - 16C$$

whereby ΔH is expressed in gammas and is referred to the 50° geomagnetic latitude.

Cyclic Variations of Inclination

The agreement of the cyclic variations of inclination (Table 4) at the various observatories is just as evident as the agreement in the horizontal component. The variations of these 2 elements of the magnetic field are quite similar to each other, but their signs are opposite. As the solar and magentic activity increase, the inclination increases, while the horizontal component decreases.

The average weighted result (Table 7 and Figure 5) is obtained for the inclination in a manner similar to that described above for the horizontal component, with the following few differences. The Irkutsk data were taken with a weight of 0.24 all the time; the value of the inclination was corrected only for 1913. In the Sverdlovsk data 2 years were corrected -- 1905 and 1906 (both were replaced with the average for 1904 and 1907). The data prior to 1887 were discarded, and for the years 1887-1891 uniformly-decreasing corrections (from 2.0 in 1887 to 0 in 1892) were introduced, for between 1885 and 1887 there is a break in the inclination amounting to approximately 4.4'. The Kazan' data prior to 1930 were subjected to double smoothing, rather than single smoothing as employed for the horizontal component.

The agreement between the ΔI and the ΔH (inverted) curves in Figure 5 is quite good, particularly since 1890. It must be noted that this agreement may be due to a considerable extent to the fact that the inclination and the horizontal component is related by an equation of the form H tg I = Z.

The average amplitude of the 11-year fluctuation in the inclination amounts to one angular minute.

Cyclic Variations of the Declination

The overall picture of the cyclic variations of the declination (Table 5) is not as clear, although the declination can be measured simpler and more accurately than other elements of the magnetic field. Owing to the low accuracy, it was necessary to discard only the old observation in Sverdlovsk (to the middle 1880's) and the Kazan' observations prior to the removal of the observatory to Zaymishche. The remaining data are more or less in agreement with the course of Z at the observatories chosen, with the exception of Irkutsk. The Leningrad and Sverdlovsk curves are in considerable agreement with each other. Quite noticeable is the agreement of the variations in the declination in Kazan' and those in Sverdlovsk. The Tbilisi curve is in sufficiently good agreement with that of Kazan', with the exception of 1936 and 1937. But if Tbilisi and Leningrad are directly compared, the observed agreement is much smaller. Unlike H and I, the cyclic variations of the declination are not global in character, but are more regional, and the farther apart the compared points, the less the agreement between the declination variations. The utter lack of agreement of the Irkutsk curve with the remaining can also be related to the great distance between Irkutsk and all the other observatories under consideration.

It is necessary to consider the Irkutsk curve with greater attention. The large zigzag on it betwee 1924 and 1934 undoubtedly indicates a break in the uniformity of the observations of the declination about 1928. The arch of 1907-1911 is probably also due to shortcomings in observations. The remaining portion of the Irkutsk curve represents rather small oscillations and leads to the assumption that the actual cyclic variations of the declination are small or even nonexistent in Irkutsk. This circumstance favors the assumption that the vector of the magnetic field of the cyclic variations like the vector of the "post-perturbation" field, is parallel to the geomagnetic axis of the earth. Under such an assumption, the amplitudes of the cyclic variations of the declination should be proportional, other conditions being equal, to the sine of the angle between the magnetic and geomagnetic meridians of a given point, and the angle between these meridians is only one degree in Irkutsk, but reaches 18 degrees in Tbilisi, 25 degrees in Kazan', and 26 degrees in Sverdlovsk and Leningrad. Let us also note that in all 5 of the observatories considered above the north of the magnetic needle deflects to the east of the geomagnetic meridian, and therefore the sign of the variation of the declination should be the same at all these observatories, and a positive sign (i.e., deflection of the needle to the east) should correspond to a reduced value of the horizontal component, while a negative sign should correspond to a higher value. The increase in the horizontal component by 10 gammas should correspond to a westward change in the declination by 1.1 minutes in Leningrad and only 0.04 minutes in Irkutsk. All these consequences that follow from the fact that the field of the cyclic variations is parallel to the direction of the geomagnetic axis are in general confirmed. It must be noted, however, that the phases of the oscillations of the declination and of the horizontal component far from exhibit as clear an agreement as occurs between the inclination and the horizontal component. The averaged curve of the declination variation shown in Figure 5 (using Leningrad, Sverdlovsk, Kazan', and Tbilisi data, equally weighted) shows a somewhat lesser agreement with the course of the sunspot numbers, and a considerably lesser agreement with the course of the magnetic activity, than is shown by the curves of the variations of H and I.

Cyclic Variations of the Vertical Component

It is impossible to establish an agreement between the cyclic variations of the vertical component (Table 6) obtained at different observatories. Only since 1920 does one note a certain agreement between the curves of the 2 better observatories, Leningrad and Sverdlovsk. Random fluctuations are large and the actual variation of Z are masked by these fluctuations. The accuracy with which Z is measured at the present time is still inadequate for a study of cyclic variations.

Conclusions

1. In middle latitudes (40 degrees - 60 degrees) the amplitudes of the 11-year magnetic variations are small, on the order of 1 minute in I and D and 10 gammas in H; the variations in Z are even smaller, and it is impossible to detect them with assurance, owing to the inadequate accuracy of the measurement of the vertical component.

2. The cyclic magnetic variations agree with the course of the sunspot activity of the sun, but they show an even greater agreement with the course of the geomagnetic activity.

3. The most regular are the variations of H and I. Their course, for the period 1878-1940 over the entire territory of the USSR (with the exception of the polar region) can be satisfactorily represented by Table 6, for the effect of the geomagnetic latitude on the amplitude of the variations is still unnoticeable within these boundaries.

4. The magnitude of the variation of D depends on the angle between the magnetic and geomagnetic meridians, thereby proving the correctness of the assumption that the vector of the field of the cyclic variations is parallel to the direction of the geomagnetic axis.

5. With increasing solar and magnetic activity, the horizontal component decreases, the inclination increases, and the declination changes in such a way that the angle between the direction of the magnetic needle and the geomagnetic meridian increases.

In conclusion, let us notice that the fact that the cyclic variations in H and also in I as observed in different observatories are not in full agreement, probably not only because of the inaccuracy in observations, but also because of other factors which are still unclear.

In a book (31) published in the US in 1947 the data from several observatories was analyzed by fitting a smooth curve to the observed secular trend. The results obtained are clearly unsatisfactory at the ends of the time interval taken, for they contradict the course of the solar activity, particularly after 1934. Comparison of the results cited in the above book with those given above are clear evidence in favor of the method of the sliding 11-year averages.

It is appropriate to remark here that the materials collected in that book (31) concerning the cyclic variations, using data from 20 observatories located at geomagnetic latitudes from 60.0 to -46.7° proves that the cyclic variations of H at all these latitudes have the same form and in principle differ only in amplitude.

CHAPTER II. LONG-PERIOD GEOMAGNETIC VARIATIONS

Until recently it was assumed that the periodic variation of the terrestrial magnetism with the longest period is the annual variation. The cyclic variations which were discussed above do not seem to be rigorously periodic, inasmuch as the duration of one cycle is not equal to that of another. In addition, solar-diurnal and lunar-diurnal periodic variations were known, as were various manifestations of magnetic activity that can not be classified periodic variations. However, a careful study of many average monthly values of the magnetic elements has recently disclosed still another variation of periodic character having a period on the order of 2 years (12). This variation is called in this account the "long-period geomagnetic variations."

The long-period geomagnetic variations are separated in the following manner. Using successive monthly-average values of a magnetic element, one forms 2 series of averages: one series is that of the 12-month average and is a generalization of a series of annual averages, and the other series is that of the 24-month average. Let us explain the sequence by which these 2 series are formed. Twelve monthly averages, pertaining to 12 months of a single year, yield upon averaging a quantity which we call G_1. Next, 12 monthly averages, pertaining to February through December of the given year and to January of the next year, yield a quantity which we shall

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denote G_2. Next, 12 monthly averages, starting with that belonging to March through December, and in addition to January and February of the following year, form the quantity G_3, etc. The series of quantities G_1, G_2, G_3, etc are conveniently called the series of successive sliding 12-month averages. In a similar manner one forms also the second series of sliding 24-month averages. It is easy to check that if the quantities G_1 are referred to the first day of the month, then the 24-month averages should also be referred to the first days of the month. The quantities G_1 must evidently be assumed as free of the effects of the annual variations, and differences between the 24-month and 12-month averages, referred correspondingly to the same instants of time, should be caused by the long-period variation. Thus, the long-period variations were determined from the data of the following magnetic observatories: Yakutsk, Sverdlovsk, Kazan', Irkutsk, Tbilisi, and Tashkent. For all observatories, with the exception of Yakutsk, the long-period variations were determined for all 7 geomagnetic elements (D, I, H, X, Y, Z, F) and for Yakutsk only for 4: G, H, X, Y. In all observatories the monthly values of the long-period variations were determined from January 1938 through December 1948, i.e., for consecutive years.

Table 9 contains the values of the long-period variations, determined as explained above. From an examination of the data contained in this table, it is evident that the long-period variation has an amplitude up to 8 gammas in H, up to 15 gammas in Z, and approximately 1 angular minute in the declination, with the amplitudes of the remaining elements having corresponding values. In addition, it is evident from Table 9 that the period of variation is not exactly 24 months, and it is possible that it is somewhat larger. The latter conclusion is confirmed by an examination of Table 10, which gives the 24-month variations averaged for the entire 11 years. In fact, the averaging of 5 ½ series of values for the variation leads to a considerable reduction in the amplitudes of the variation. However, on the other hand, the agreement between the shape of the average variation in many observatories is further corroboration of the actual existence of the long-period variation under consideration. Particularly clear is the agreement between the shape of the variation in the elements H and X.

The data of Table 10 are repeated in Figures 7, 8, and 9, and this facilitates comparison of the data of all the observatories. Most noticeable, in addition to the similarity between H and X variations in all the observatories, is the dependence of the variations in D and Y on the absolute value of the declination.

In conclusion, let us remark that the long-period variation, according to recently-published results (12), does not originate within the earth (probably in the atmosphere).

CHAPTER III. ANNUAL GEOMAGNETIC VARIATIONS

The annual variations of the earth's magnetic field are the periodic changes in the earth's magnetic field, having a period of one year. The sequence, for example, of the monthly average values of any magnetic element represents the annual variations of this element at the given location, superimposed on the secular variations. (Here the values of the cyclic and long-period variations are neglected, for they change but little over several neighboring months.) Using certain measures, explained below, it is possible to separate the secular variations and to obtain the annual variations for a given location in a form free of the secular variations.

In each place on earth the annual variations have a definite form. The annual variations contain in first approximation 2 periodic components: the annual and the semiannual. The geographic distribution of the annual and semiannual components differs, and this has led many investigators to the conclusion that the causes of these 2 components are different. At the present time it is universally acknowledged that the causes of the annual component are the cyclic variations of the illumination conditions in the earth's atmosphere, and the causes of the semiannual component are the semiannual variations of the magnetic activity. Thus, the causes of the annual component are admittedly connected with changes in the conditions under which the wave radiation of the sun affects the earth's atmosphere, and the causes of the semiannual component are admittedly connected to changes in conditions under which the corpuscular radiation of the sun affects the earth.

The literature devoted to the problem of the annual variation is scant. Recently works by V. I. Afanas'yeva (1), (2), were published, and in addition a summary of the data on the annual variations is given in graphic form in an American work (31). We shall not dwell on a discussion of the contents of these works, for we give below sufficiently full information concerning the form and magnitude of the annual variations, so as to permit dispensing with other references when solving the majority of practical problems. Data on the annual variations, given below, are obtained from materials of observation made in 11 middle-latitude magnetic observatories in the USSR, principally from

1938 through 1948. The list of these 11 observatories is given in Table 1 together with information on what materials from which year were used for each observatory.

As was already remarked above, the consecutive monthly average values of the magnetic elements give the annual variations superimposed on the secular variations. Many methods are used to separate the annual variations from the secular ones. In this work we employ a method that agrees with that explained in the work by Yu. D. Kalinin (12). We assume that for each magnetic element in any n'th month the annual variation is the deviation of the average monthly value of the element from the average obtained for a time interval twelve months long, the center of which coincides with the start of the n'th month. Therefore, the observation materials from the magnetic elements were used to form series of sliding 12-month averages (each such average is referred to a time coinciding with the start of one of the months, since the averaging interval contains an even number of months), and the deviations of the individual monthly averages were determined from the values of the corresponding averages for the 12 monthly intervals. This yielded the annual variations in the northern component (X), eastern component (Y), vertical component (Z), declination (D), horizontal component (H), inclination (I), and the total intensity (F) averages for all the years, as well as individual values for years of high and low solar activity. The tables and the diagrams give the values of the annual variations in H, X, Y, Z, and F in gammas, and those of the declination and inclination in minutes.

The annual variations for years of varying solar activity were calculated to determine the dependence of the annual variations on the level of the solar activity, inasmuch as it is known that the annual variations depend on the solar activity.

Form of Annual Variations

The results obtained make possible a description of the annual variations for the latitude belt from 40 to 60 degrees north.

The annual variation in H is in the form of a double wave. Its principal maximum occurs in June, the secondary in December. The minima occur during the equinox months, March through April and September through October. Neither the form nor the magnitude change noticeably within the latitude belt of 40-60 degrees north. When the solar activity changes from the minimum to the maximum level within the activity cycle under consideration, the annual variation in H nearly doubles in amplitude. The annual variation in H is presented in Tables 11, 12, 13, and in Figure 10.

The annual variation in X is similar to the annual variation in H in form and in character of the variations within the cycle of solar activity. The annual variation in X is represented in Tables 11, 12, and 13.

The annual variation in the declination is also in the form of a double wave. In those places on the earth's surface where the declination is to the east, the maxima of the double wave occur in March and October, while the minima occur in June-July and December-January. In places where the declination is to the west, on the other hand, the maxima occur in June-July and December-January, and the minima in March and October. The annual variations of the declination exhibit clearly the dependence of both in the form and amplitude of these variations on the average value of the

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declination in a given point. This dependence is clearly seen, by arranging the graphs of the annual variations of the declination from several observatories in accordance with the numerical value of the angle of declination or the angle between the magnetic and geomagnetic meridians. The dependence of the amplitude of the annual variation of the declination on the numerical value of the declination can be expressed by the following equation

$$A = 5' + D' : 60$$

where A is the amplitude in angular minutes, D the declination in angular minutes, and 5 is a constant quantity. The annual variation in the declination depends only insignificantly on the level of the solar activity. The annual variation in the declination is presented in Tables 11, 12, and 13 and in Figure 11.

The annual variation in Y also has the form of a double wave with maxima in March and September-October, and minima in June and December-January. The amplitude of the annual variation in Y is very small, and in different observatories it varies from 2 gammas at low solar activity to 9 gammas at high solar activity. The amplitude of the annual variation in Y depends on the value of Y similarly as the amplitude of the annual variation in the declination depends on the average value of D.

The dependence noted above of the amplitude and shape of the annual variations of declination D and eastern component Y on the average values of D and Y can be interpreted as the result of the fact that the field of the annual variations is in general directed along the axis of the earth's uniform magnetization. An increase in the intensity of this field causes the direction of the vector of the magnetic field to approach the direction parallel to the axis of the homogeneous earth's magnetization.

The annual variation in Y is represented in Tables 11, 12, and 13. The annual variation in Z has the shape of a double wave with a principal minimum in June-July and a second minimum in December-January, with the maxima in March and September-October.

The annual variation in Z changes little with latitude in the territory of the USSR. The annual variation in Z has a maximum amplitude in Irkutsk and Tbilisi, both with respect to the average obtained by 11 years observations, as well as for the years in which the solar activity is high or low. The amplitude of the annual variation in Z increases insignificantly with increasing solar activity. The annual variation Z is represented in Tables 11, 12, and 13, as well as in Figure 12.

The annual variation in the inclination has the shape of a double wave with a principal minimum in June-July and a second minimum in December-January; the maxima occur in March and September-October, the same as for the annual variation in Z. The dependence of the annual variation in I on the latitude, within the range of latitudes from 60° to 40°, is insignificant, but a certain increase in amplitude is noted at southern latitudes.

The dependence on the solar activity is clearly pronounced. In years of high solar activity the amplitudes are 2 or 3 times greater than in years of low solar activity. The annual variation in I is represented in Tables 11, 12, and 13.

If we examine the annual variation in F as averaged over 11 years, it can be said that it has the shape of a double wave. For years of high and low solar activity, the form of the annual variation in F is noticeably distinct and differs from the form of the 11-year average. This may be caused in part by the fact that for years of high and low solar activity a smaller number of years is used to compute the annual variation in F.

The amplitude of the annual variation in F changes very little with latitude, increasing insignificantly southward.

The amplitude of the annual variation in F depends little on the level of the solar activity. The annual variation in F is represented in Tables 11, 12, and 13, as well as in Figure 13.

Reference (1) mentioned above contains information concerning the annual variations not only for the territory of the USSR. It contains a description of the geographic distribution of the annual variations for all the latitudes of the earth's sphere. It is noted in particular that at high latitudes the annual variations in the northern component (and consequently also in the horizontal, as a first approximation) have the form of a simple annual wave, and this form is replaced by a double wave at latitudes close to the so-called zone of maximum magnetic activity. The author did not observe thereby an increase in the amplitude of the annual variations near the equator, as was noted by American investigators (31). The annual variations of the eastern component are small at all latitudes. It is noted with respect to the annual variations of the vertical component that at equatorial latitudes it is small and that in the southern hemisphere it has a form that is the reverse of the form for the corresponding latitudes of the northern hemisphere.

Dependence of the Annual Variations on the Solar Activity

The solar activity varied during the time period of observations (from 1938 through 1948) from the years of minimum solar activity to the years of the maximum within relatively very large limits.

The average relative number of sunspots W for the minimum years 1943 and 1944 was 13.3; for the maximum years 1938, 1947, and 1948 it was 132.4, i.e., the relative number of sunspots changed by 10 times from the minimum years to the maximum years. The amplitudes of the annual variations in H and in I during the period under consideration increased from years of low solar activity to the years of high activity by 2 times, i.e., by approximately 15 gammas. However there is no sense in examining in detail the changes in the annual variations as a function of W, since their individual changes in individual years are considerably greater than the changes related to the level of solar activity.

Extent to which the Annual Variation, Obtained by Averaging the Data for 11 Years, Represent the Annual Variation for a Single Year

To answer the question to what extent the annual variations averaged over a number of years represent the annual variations for an individual year, a determination was made of the greatest amounts by which the annual averages deviate in individual months, from the averaged annual variations for 11 years. Such calculations were carried out for the elements H, Z, and F, for which the annual variations have the maximum value.

It is evident from Tables 14 and 15 that the most that the annual variation of an individual year deviates from the average annual variation is on the order of the annual variation itself. Table 16 represents the maximum values that the annual variations in H, Z, and F deviate from the average annual variation averaged over many years, and also the averages of the maximum deviations for each observatory and for all observatories. This table leads to the conclusion that the annual variation for an individual year in H, Z, and F may deviate on the average from the many-year average annual variation by ± 10 gammas.

The greatest deviations from the average annual variation in H, Z, and F occur most frequently in January and in February.

Conclusions

1. The annual variation of all the elements of the magnetic field (X, Y, Z, D, H, I) and of the total intensity vector (F) has the shape of a double wave with extrema at the equinoxes and solstices.

2. The principal maximum of the annual variations in H and in X occurs in June, the secondary maximum occurs in December, the minima occur in March and October-September; the fall minimum is greater in absolute magnitude; the values are nearly zero in April-May and August-September.

As opposed to H and X, the annual variations of Z and I have their principal minimum in June-July and their secondary one in December-January; the maxima of March and October are approximately equal in magnitude. The values of the annual variation of D are close to zero in April-June in middle latitudes.

3. The extrema of the annual variations do not shift in a definite manner from month to month with changing solar activity.

4. The magnitudes of the positive and negative extremal deviations from zero occurring in the annual variations can be assumed to be equal in each element.

5. The values of the annual variations in H, Z, I, and F are smallest in April and May, August and September, and this is true for any level of solar activity.

6. It follows from the above that the monthly averages for

April-May or August-September differ from the average annual values only because of the secular variations.

7. Within the limits of the USSR at latitudes from 60 to 40° it is possible to assume that the annual variations in H, Z, F, X, and I are constant in form and that their magnitude is independent of the coordinates of the locality.

8. The dependence of the annual variations on the solar activity is most pronounced in H, I, and X and is less pronounced in Z, F, D, and Y.

9. The annual variations in H and I change approximately by a factor of 2 with changing solar activity, equivalent to approximately 1[illegible] gammas in absolute value. This change is within the limits of those changes in annual variations from year to year, which are observed at equal levels of solar activity.

10. The annual variations in Y are small in magnitude (on the order of 2 to 7 gammas).

11. The annual variations in the declination depend on the local value of the magnetic declination.

12. The annual variations obtained as averages for 11 years of observations characterize the annual variations for individual years, with the average deviation ranging within ±10 gammas.

CHAPTER IV. SOLAR-DIURNAL GEOMAGNETIC VARIATIONS

The solar-diurnal geomagnetic variations are the periodic changes in the earth's magnetic field, having a period equal to the solar day. There exist also lunar-diurnal geomagnetic variations, but they are so small, that their study is of interest only for certain theoretical problems. In this handbook we give no data at all on the lunar-diurnal variations. For the sake of brevity the solar-diurnal geomagnetic variations are frequently called daily variations.

Each modern magnetic observatory, as has already been mentioned in the introduction, records continuously (usually photographically) the changes in the magnetic field with time. The photographic film containing the record for an individual day is called the magnetogram (see Figures 3 and 4). If the days are sufficiently free from magnetic disturbances, a simple examination of the magnetogram permits discerning the daily variations. In this case they are also noted in many average hourly values of magnetic elements, determined from the magnetogram. Selecting during one month several days free of magnetic disturbances and obtaining the average values of the daily variations from the data for these days, one obtains the so-called daily variations for quiet days. It is possible, on the other hand, to select during the month several days with magnetic disturbances and to obtain the average values of the daily variations for these days, so-called "disturbed" in the magnetic sense. In this case one obtains the daily variations for disturbed days. The shapes of the daily variations for quiet days and for disturbed days are generally different. The laws which they obey (for example, the geographic distribution) are also different, and the daily variations for quiet days and the physical nature of the daily variations for disturbed days is also different.

In practice it is customary to select in each month the 5 days most free from magnetic disturbances (quiet days) and the 5 days during which the magnetic disturbances are a maximum (disturbed days). On the other hand, if the daily variations are determined by averaging the data for all days within a single calendar month, the daily variations obtained in this manner are customarily called the daily variations for all days.

In low and middle latitudes, i.e., where the magnetic disturbances are relatively small, the daily variations for all days are very close to the daily variations for quiet days. In high latitudes (particularly in the north) i.e., where the magnetic disturbance is relatively high, the daily variations for all days are close in shape and in magnitude to the daily variations for disturbed days.

Quiet and disturbed days are usually selected in accordance with the data of a group of magnetic observatories. It turns out frequently in this case that in days assumed by the majority of observatories to be quiet, the magnetic field at high-latitude observatories is not quiet, but disturbed.

An analysis of the laws to which the daily variations for quiet days are subjected at low and middle-latitude observatories has led to the conclusion that these daily variations are caused by mechanical motion of layers of atmosphere, located at an altitude on the order of 100 km above the surface of the earth. These layers (ionosphere) are ionized under the influence of the ultra-violet radiation from the sun and are good electric conductors. The motion of these layers in the permanent magnetic field of the earth induces in them electric currents. The magnetic field of these currents is the principal component of the field of the daily variations in quiet days. The direction and the strength of the induced currents depends on the conditions under which the earth's atmosphere is illuminated by the sun. Therefore, the daily variations for quiet days in middle and low geographic latitudes depend on the geographic latitudes, on the local time of the day, and on the time of the year. In addition, inasmuch as the ionizing force of the lights from the sun changes during the 11-year cycle of solar activity, these variations depend also on the level of solar activity (3).

The daily variations for quiet days in low and middle latitudes are usually called the quiet daily variations. This name is not applied to the daily variations for quiet days in high latitudes, for there the earth's magnetic field is not free from magnetic disturbance even in quiet days.

During disturbances in general, and in disturbed days in particular, the daily variations are caused by electric currents produced in the earth atmosphere by the corpuscular radiation from the sun. The streams of solar particles reach the earth from time to time during its annual travel around the sun and cause many geophysical phenomena, which are given the unified name of magnetoionospheric disturbances of storms. With this, at high latitudes, at altitudes of 200-300 km in the earth atmosphere, electric currents are developed, which are several times stronger than those causing the quiet daily variation. In middle and low latitudes there occur at the same time supplementary currents weaker than those in high latitudes, and this produces the so-called disturbed geomagnetic daily variations (see Chapter V for more details concerning them).

Observations do not provide an answer to the question as to what occurs with quiet daily variations during the time of magneto-ionospheric disturbances, but based on the idea that the wave radiation of the sun, which causes the quiet variations, does not stop during the time of magneto-ionospheric disturbances, one must assume that the daily variations for quiet days equal the algebraic sum of the 2 types of variations that depend on the local time: quiet daily variations and disturbed daily variations.

This chapter considers in greater detail the daily variations for quiet days and in less detail the daily variation for disturbed days, using data from the 16 magnetic observatories listed in Table 1. (The daily variations for disturbed days agree fundamentally with the disturbed daily variations, concerning which see Chapter V.) In order to be able to see the character of the dependence of the variation on the level of solar (and magnetic) activity, the information on the variations is given not only as averages for 11 years, but also separately for years of high magnetic activity and years of low magnetic activity. To be able to see the character of the dependence of the variation on the time of the year, information concerning the variations are given not only as averages for the year, but also for 3 seasons, usually employed in the study of terrestrial magnetism, viz., for summer (May-August), winter (November-February), and the equinoxes (March-April and September-October).

Daily Variations of Declination

The daily variations of the declination (D) in all the magnetic observatories of the USSR, starting with the observatory of Bukhta Tihaya and further to the south, have the shape of a simple daily wave in quiet days in the summer. In those observatories, where the declination is to the east, the presence of daily variations causes the declination to reach a maximum value at approximately 0800 local time and the minimum value at approximately 1400 local time Figure 14, Table 17). In observatories where the declination is to the west, the minimum values are noted, conversely, approximately 0800 and the maximum value at approximately 1400.

In winter in quiet days the daily variations of the declination at all observatories from Bukhta Tikhaya and farther south have the same simple form as in the summer, but their amplitude is on the average about 4 times smaller than that of the summer.

Comparing the daily variations of the declination obtained in many USSR observatories, starting with the observatory of Bukhta Tikhaya and farther to the south, it is clearly seen that the shape of the daily variations in the 4 polar observatories (Bukhta Tikhaya, Mys Chelyuskin, Dikson, and Matochkin Shar), having much in common between them, differ sharply from the shape of the variations at the remaining observatories farther to the south. This difference remains in force in all seasons of the year, being particularly great in the summer months. Accordingly, as was already noted, the daily variations in the 4 above-named observatories, calculated for quiet days, turn out nevertheless not to be the quiet daily variations, but the sum of the quiet variations and the disturbed daily variations (see Chapter V). It is important to emphasize that the northernmost of the existing observatories, in which the type of daily variation turns out to be of the middle-latitude type, is such a northern observatory as Bukhta Tikhaya.

The daily variations of the declination for quiet days increase in amplitude with increasing level of activity (magnetic and solar), but do not change their shape in all observatories, without exception, including also the 4 northernmost ones (see Figures 18 and 19, Tables 20 and 21). In all observatories from Srednikan and Yakutsk and further to the south the amplitudes of the daily variations of the declination in years of low activity do not exceed 13' for the more northerly of these observatories, and 2' at the most southerly of the observatories. During years of high activity the amplitudes increase to 18' and 5' respectively. At high latitudes, the amplitudes in days which are quiet by middle-latitude standards are greater than the amplitudes of the variation for the middle-latitude observatories by 4 to 5 times. However, as the activity level varies within the 11-year cycle no large changes are observed in the amplitudes at the high-latitude observatories (instead of 12 to 98' in years of low activity, the amplitudes are 14 to 92' in years of high activity).

The daily variations for disturbed days (Table 26 and 27) at all observatories from the most southerly (Tashkent) to Yakutsk differ very little from the daily variations for quiet days and have amplitudes ranging from 4 minutes at the south to 20 minutes in the north (in Yakutsk). Only in the remaining more northerly observatories does the shape of the daily variations for disturbed days differ substantially from the shape of the daily variations for quiet days. At these 6 northern observatories the maximum of the eastern declination in disturbed days occurs on the average at approximately 0600 local time and the minimum occurs at approximately 1800 to 2000. At these northern observatories the amplitude in disturbed days is furthermore 3 to 4 times greater than the amplitude in quiet days.

The shape and amplitudes of the variations for disturbed days change little with changing level of magnetic and solar activity, increasing with the activity level. In years of low activity the amplitudes at various observatories range from 48 to 170 minutes, and in years of high activity they range from 48 to 176 minutes (Tables 26 and 27).

Daily Variations of Horizontal Component

The most characteristic feature of the daily variations of horizontal component (H) for quiet days in the summer and in the equinoxes at all observatories, starting with the observatory of Bukhta Tikhaya and further to the south, is a minimum occurring in mid-day of local mean time (Figure 15 and Table 18). At southern observatories (Vladivostok, Tbilisi, Tashkent) still another characteristic feature is added to this, viz., a secondary minimum (less deep) at approximately 1700 to 1800. In the winter the daily variations of H for quiet days are considerably smaller at all observatories than in the summer (amplitudes are smaller by 3 to 4 times).

Just as with respect to the variations of the declination, the observatories of Bukhta Tikhaya, Mys Chelyuskin, Dikson, and Matochkin Shar form a separate group. At these observatories the daily variations of the horizontal component have even in quiet days a form of a double wave with a maximum in the morning and evening hours. The amplitudes at these observatories are 3 to 4 times greater than those at the more southerly observatories.

The daily variations of the horizontal component for disturbed days differ in a definite manner in almost all the observatories under consideration from the daily variations for quiet days (Tables 28 and 29). Particularly great is the difference at the observatories from Uelen and farther to the north. A certain similarity remains only at the observatories of Yakutsk, Sverdlovsk, and Kazan', and at the more southerly observatories the daily variations for disturbed days differ also in many features from the corresponding variations for quiet days. For the more northerly observatories the disturbed days are characterized by a minimum in the hours past midnight and a maximum at approximately 1800. For more southerly observatories the disturbed days are characterized in the winter months by a maximum during the morning hours and a minimum in the evening hours, and in the summer by a maximum in the forenoon hours and a minimum immediately after noon.

With increasing activity level (magnetic and solar) the shape of the daily variations of H for quiet days changes but little at the middle-latitude and northern observatories. The amplitudes of the variations increase somewhat. At the polar observatories, to the contrary, the amplitude decreases somewhat with increasing activity (see Figures 21 and 22 and Tables 22 and 23). In middle latitudes in years of low activity the amplitudes are 7 to 40 gammas, and in years of high activities they are 8 to 74 gammas. In high latitudes the respective amplitudes are 44 to 80 gammas in years of low activity and 27 to 77 gammas in years of high activity.

The daily variations for disturbed days increase somewhat in amplitude with increasing level of magnetic activity, maintaining their form at high latitudes, but in middle and low latitudes the increase in amplitude is accompanied by a noticeable change in the form of the variation (Tables 28 and 29). At high latitudes during years of low magnetic activity the amplitudes at various observatories range from 90 to 402 gammas, and in years of high activity they range from 50 to 460 gammas.

In middle and southern latitudes the respective amplitudes are 18 to 58 gammas in years of low activity and 25 to 109 gammas in years of high activity.

<u>Daily Variations of Vertical Component</u>

Within the latitude belt considered in this handbook, the daily variations of the vertical components for quiet days have certain characteristic shapes (Figures 16, 22, 23; Tables 19, 24, 25). One form is observed in the observatories from Tashkent to Leningrad, viz., a simple daily wave with a maximum before noon and a minimum shortly after noon. The amplitudes of this form of variation are greatest in the south and smallest in the north (Leningrad). In the Bukhta Tikhaya observatory one observes another form: a minimum at approximately 0600 and a maximum after noon. In the Matochkin Shar and Dikson observatories one observes the so-called transition in the form of a double wave, while in Bukhta Tikhaya one observes the form of a complicated curve with a principal maximum in the after-midnight hours and a minimum before midnight. These principal forms replace each other gradually in the intermediate observatories (Yakutsk-Uelen). The summer amplitudes are 3 times greater than the winter amplitudes in the middle and southern latitude observatories and are almost the same at high latitudes.

The variations for disturbed days (Tables 30, 31) are in agreement with the variations for quiet days only at the most southern observatories: Tashkent, Tbilisi, and Odessa. At all other observatories these 2 types of variations differ noticeably both in shape and in amplitude, whereby the amplitude is on the average 3 times greater in disturbed days in middle latitude and 9 times greater at high latitude. Very pronounced are the changes in the shapes of the daily variations for disturbed days with changing activity level (magnetic and solar). It is characteristic that in the Moscow, Kazan', Sverdlovsk, and Leningrad observatories in years of high activity the shape of the variations for disturbed days becomes identical with the shape of these variations for years of low activity at the more northerly observatories (Uelen), and in the case of the more northerly observatories

(Uelen and farther to the north) during the transition from years of low activity to years of high activity, the amplitudes of variations for disturbed days change little and even decrease in some observatories.

In middle latitudes during years of low magnetic activity the amplitudes of the variations for quiet days are 4 to 16 gammas, and in years of high activity they are 6 to 26 gammas. At high latitudes they are 20 to 29 gammas in years of low activities and 15 to 70 gammas in years of high activity.

The amplitudes of variations for disturbed days in years of low activity are 9 to 36 gammas in middle latitudes and 103 to 305 gammas at high latitudes, while the respective values for years of high activity are 14 to 128 gammas in middle latitudes and 128 to 315 gammas at high latitudes.

Daily Variation of the Total Intensity

(This section was prepared at the Main Geophysical Observatory by Z. S. Kuznetsova.)

Recent years have seen a development of work on aeromagnetic photography of the modulus of the total intensity of the earth's magnetic field F. In connection with this an interest arose in the variations of the total intensity F and in particular in the daily variations of the total intensity.

Within the confines of the USSR the daily variations of the total intensity have a great similarity to the daily variations of the vertical component. In the observatories from Tashkent to Leningrad the daily variations of the total intensity, averaged for quiet days, have the shape of a simple wave in which the amplitudes around mid-day are decreased relative to the daily-average values (Figure 17 and Table 32). The amplitude is close to 20 gammas. In the summer the amplitude is somewhat greater (approximately 30 gammas); in the winter it is somewhat less (approximately 10 gammas). In the observatories farther north from Leningrad the shape of the variations for quiet days is more complicated. The shapes of the variations in the Tiksi and Mys Chelyuskin observatories are approximately in opposition (decreases in one observatory in the values of the total intensity correspond during the same hours to increases at the other observatory, and vice versa). Thus, a transition zone, or a zone of inversion of the shape of variations, is located between these 2 observatories.

It is known that in normal ionosphere there is no reason to attach any particular significance to the latitudes between these observatories, but on the other hand (see below, Chapters V through VII) during the time of magnetic disturbances, the zone of maximum aurora frequency, or the zone of maximum magnetic activity, is a special zone in the earth's variable magnetic field. Therefore, the complex character of the daily variations noted above proves that at the latitudes north of the Uelen and Tiksi observatories the daily variations of the total intensity behave even in quiet days like phenomena caused by corpuscular rather than wave radiation from the sun.

When the level of activity increases, the amplitudes of the daily variations of the total intensity increase somewhat in quiet days in middle latitudes and north of the transition zone, but decrease in the region of this transition zone. The above is clearly evident from Figures 24, 25, 26, and Tables 33, 34, and 35.

Variations for disturbed days remain similar to variations for quiet days only in the most southerly observatories of the USSR, Tashkent, and Tbilisi (Tables 36, 37). In all other observatories north of the above 2 the shape is quite different. It is characteristic that the transition zone is seen also in this type of variation, but is most noticeable in the data from the Tiksi observatory. The Uelen and Matochkin Shar observatories form a pair in which the shapes of the variations are the opposite of each other. Thus, in disturbed days the reversal in type occurs at more southerly latitudes than in quiet days. The amplitudes, which differ little from the amplitudes of the variations in quiet days at low latitudes, increase strongly in disturbed days in the north. Where the amplitudes in the north are 40 to 60 gammas in quiet days, they are 250 to 300 gammas in disturbed days. The dependence of the amplitudes on the level of activity is as follows: in low latitudes and in the northern inversion zones the amplitudes increase with increased activity, and in the transition zone they decrease somewhat.

The amplitudes of the total intensity, depending on the changes in magnetic activity, are characterized by the following values: in years of low magnetic activity, in quiet days, the amplitudes of the total intensity in middle latitudes range from 6 to 26 gammas; in years of high activity they range from 8 to 35 gammas. In high latitudes in years of low magnetic activity in quiet days the amplitudes vary from 20 to 65 gammas, and in years of high magnetic activity, from 35 to 110 gammas. In disturbed days in years of low magnetic activity the amplitudes of the total intensity in middle latitudes have values from 11 to 64 gammas; and in years of high activity from 13 to 104 gammas. At high latitudes in years of low activity in similar days the amplitudes of the variations of the total intensity range from 150 to 300 gammas, and finally, in years of high activity, from 230 to 375 gammas.

<u>Dependence of the Amplitude of the Daily Variations on the Geographic Latitude</u>

If we compare the dependence of the amplitude of the daily variations of the declination for quiet days on the geographic latitude for years of high activity (1947-1948) with the similar dependence for years of low activity (1944), it can be seen that while the increase in activity is accompanied by an increase in amplitude at low and middle latitudes, at high latitudes, to the contrary, an increase in activity causes a reduction in the amplitude (Figure 26). The same relationship holds also for amplitudes of the daily variations of the declination for disturbed days.

The same general rule holds also for the amplitudes of the daily variations of the horizontal component for quiet days, but the rule is more complicated for the daily variations of the horizontal component for disturbed days. In the latter case the zones farther to the north, in which an increase in activity is accompanied by a decrease in the amplitudes, there exists another zone, in which, as in the southern latitudes, an increase in activity is accompanied by an increase in amplitudes.

Still more complicated is the dependence in the amplitudes of the variations of the vertical component. Here one notes up to 4 different regions or zones, alternating with each other. In variations for the disturbed days the rules followed by the amplitudes of the vertical component are even somewhat simpler.

Dependence of the Daily Variations on the Level of the Magnetic Activity

The fact that the classification of the daily variations into 2 types, for quiet and for disturbed days, is in a certain sense arbitrary, is seen particularly well by examination of the series of curves in Figures 27, 28, 29, 30, 31, and 32, which show the daily variations of the declination and of the horizontal and vertical components for several observatories for groups of days that are united together for similar levels in magnetic activity (having the same daily sums of magnetic 10-ball characteristic of the K index). A total of 6 groups was formed (for daily sums of the K index 0-9, 10-15, 16-20, 21-25, 26-30, and 31-45). It is clearly seen that with a gradual increase in the level of activity, the shape of the daily variations also changes gradually from a shape that is characteristic for quiet days to a shape that is characteristic for disturbed days. The changes in the amplitudes of the daily variations are similar.

Charts of Isograms of Daily Variations for Quiet Days

The attached schematic charts (Figures 33 through 38) show with the aid of isograms the daily variations for quiet days of the declination, horizontal and vertical components, averaged for the year and for each of the 3 seasons. The determination has been carried out for 11 years, and these charts represent variations for the average level of activity. To get an idea of the daily variations at a latitude at which there is no magnetic observatory, it is necessary to pass on the corresponding chart a horizontal line through the required latitudes and read along this line the values of the variation at a point corresponding to full hours of local time. This naturally gives only a very approximate idea of the variations, but nevertheless it is the best that can be obtained without data from a magnetic observatory.

Reference (3), mentioned above, contains in tabular and graphic form data on the daily variations for 47 observatories for the year 1933. These data (particularly the graphs) show visually the general laws of the geographic distribution of the daily variations on a great portion of the earth. Along with the changes of the shape of the variations with latitude, these data can be used to get an idea concerning the relative changes of the amplitudes of variations with latitude. The author of reference (3) characterizes these general laws in the following words:

"The daily course of the declination has the appearance of a simple wave with a maximum (if the eastern declination is considered positive) in the morning hours and a minimum in the evening hours -- in observatories of the northern hemisphere, and a minimum in the morning hours and a maximum in the evening hours -- in observatories of the southern hemisphere.

The daily course of the vertical component is a simple wave with a minimum in the noon hours in the northern hemisphere and a maximum in the southern hemisphere. The daily course of the horizontal component is a simple wave with a maximum in the noon hours in a belt lying approximately between 30 degrees north and 30 degrees south and a minimum to the north and to the south of this belt. The amplitudes of the daily variations reach on the average 40-50 gammas, i.e., amount to 0.1% of the value of the earth's permanent field."

CHAPTER V. DISTURBED GEOMAGNETIC VARIATIONS

Before presenting the material pertaining to the disturbed daily geomagnetic variations, let us explain as briefly as possible modern concepts concerning the nature of magnetic storms.

Magnetic storms are sharp, irregular shapes of oscillations of the earth's magnetic field both in magnitude and in direction; these are observed from time to time in magnetic observatories.* Various magnetic storms differ very greatly in duration -- from several hours to several days. During the time of magnetic storms the earth's magnetic field fluctuates within several percentage points of its magnitude (the magnetic declination sometimes changes by 1 to 2% in medium latitudes). Observations have established that magnetic storms start simultaneously over the entire earth's sphere. Certain storms begin with a sharp change in the field, well noticeable on the magnetograms, and in such cases the time of start of the storm (sudden start) is quite the same in all the observatories within the accuracy with which the time can be determined on the magnetogram. Other storms start gradually (gradual start), but their start also occurs simultaneously everywhere. Any failure to reconcile the gradual starts of certain storms as measured at different observatories is only apparent and can be attributed to the subjectivism of different persons, caused by the fact that the start of the storm is indistinct. Magnetic storms have a tendency to repeat every 27 days. During the time of magnetic storms the changes in the horizontal and vertical components are such that the following can be said about them: the field of the storm in middle and low latitudes of the earth's sphere appears in its greatest part to be a uniform field, directed in an antiparallel direction, i.e., in opposition to the field of the earth's uniform magnetization. In the geomagnetic 67-latitude zone the field of the storm is such, that it can be attributed principally to the effect of the horizontal electric current, flowing at an altitude of 100-200 km above the earth in the east-west or west-east direction.

The accepted present-day explanation for the magnetic storms is as follows (20):

As a result of processes, the physical nature of which is still not clear, the sun ejects from time to time into the surrounding interplanetary space, from the regions that appear as groups of sunspots, streams of particles (atoms, ions, and electrons) traveling

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from the sun at a velocity on the order of 1,000 to 2,000 km per second. At least some of these streams, which rotate together with the sun (which has a period of rotation of approximately 27 days relative to the earth's orbital rotation) reach the earth in its annual movement in its orbit. The streams, which contain both positive and negative electric-charged particles, become electrically polarized when they approach the earth, which has a magnetic field. The electrically charged particles in the streams become redistributed. An annular electric current is formed around the earth, in its equatorial plane. At the same time a portion of the substance of the stream, enveloping the earth, penetrates into the earth atmosphere. But since this substance carries electric charges, the earth's magnetic field will deflect this portion of the substance of the stream towards the magnetic poles of the earth and its penetration is concentrated in the polar latitudes. The particles penetrating into the earth's atmosphere cause a glow (polar [aurora] light) and create electric currents, which are particularly strong at polar latitudes. The current in the equatorial plane of the earth is located outside the earth's atmosphere (at a distance of 20,000 to 30,000 km from the earth) and produces a magnetic field, directed in opposition to the field of the homogeneous magnetization of the earth. The magnetic fields of the currents produced in the atmosphere (in the ionosphere) of the earth cause fluctuations in the magnetic field of the earth, which at first glance are disorderly and which cause an infinite variety of magnetic storms.

Inasmuch as currents are produced in the atmosphere when the latter is electrically conducting, owing to the wave radiation from the sun, these currents and their corresponding magnetic fields exhibit a periodicity with local time (since the conductivity depends on the local time). These atmospheric electric currents

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are responsible for the disturbed daily variations, which will be discussed later in this chapter. The stream (which according to the generally accepted ideas has near the earth a shape of a cylinder with a diameter on the order of 1,000 earth radii) outdistances the earth, owing to the difference between the velocity of the earth's rotation around the sun and the sun's rotation about its axis, and on the average during a few days after the start of the storm the earth remains behind the stream, surrounded in the equatorial plane with a ring of gas made up by the substance of the stream, which gradually becomes dissipated in space. During several days the field of the earth gradually returns to the values prevailing prior to the storm, as the equatorial current attenuates. The electric annular current, which attenuates gradually with the scattering of the ring, is responsible for the aperiodic geomagnetic storm-time variations described in the following chapter.

Within 27 days, if the stream did not stop existing, it again overtakes the earth and the storm phenomenon repeats.

The streams from the sun fall on the earth most frequently in the spring and fall, because during that time the earth is closest to the plane of the solar equator, about which the most streams are formed on the sun.

These, in brief, are the modern ideas concerning the nature of magnetic storms.

The disturbed daily geomagnetic variations are a regular component of the field of the magnetic storm, and this component depends principally on the degree of magnetic activity and on the local time, and also has its own characteristic geographic distribution.

There is an infinite variety in the changes of the earth's magnetic field during the time of strong magnetic storms, but by separating from them a regular portion of the disturbance it is possible to exhibit certain average properties of magnetic variation during the time of storms. Establishing these average properties of the field of the storms makes it easier to solve the problem of finding methods to combat the radio static caused by the storms. This is why a study of the disturbed daily variations, in addition to being of purely theoretical interest, is also valuable in practical problems. The disturbed daily variations are determined as the difference between the daily variations for disturbed days and the daily variations for quiet days.

The disturbed daily variations were examined from data of 17 magnetic observatories, located in the geographic latitude belt from 40 to 80 degrees (see Table 1).

In addition, use was also made of observation materials for 1938-1948 from middle-latitude observatories as well as of materials for 2 years (one year of high magnetic activity -- 1947 -- and one of low activity -- 1944) from polar observatories.

Given below are the disturbed daily variations of the 3 elements of the earth's magnetic field: declination, horizontal component, and vertical component, which have the greatest practical significance. The disturbed daily variations are calculated for the year and for 3 seasons (summer, winter, equinox, i.e., spring and fall). In addition, we give below the disturbed daily variations calculated for several categories of days, which are characterized by different values of the magnetic K-index characteristic for days, for which the sum of the eight 3-hour K-indices lies within the intervals of 10 to 15, 16 to 20, 21 to 25, 26 to 30, and 31 to 45 balls.

The disturbed daily variations for various values of the sums of the K-index were calculated from data of 3 observatories for H and Z and from data of 2 observatories for D. By analyzing the results obtained, using observation material for 11 years, it was possible to establish that at any given place the disturbed daily variations remain constant for years of equal activity. Therefore, only data for years of high and low activity are cited to show the dependence of the disturbed daily variations on the level of magnetic activity.

Disturbed Daily Variation of the Declination

In middle latitudes the disturbed daily variations of the declination have the shape of a daily wave with one maximum near midnight and one minimum near noon (Table 38 and 39, Figures 39 and 40). Within the limits of middle latitudes, the magnitude of the variation increases with increasing geographic latitude of the location. At latitudes of 62 to 66 degrees the shape of variation experiences a complete inversion; the greater the activity of the year under consideration and the farther east is the latitude of the place, the farther south occurs this inversion (Figures 52 and 53). Seasonal changes do not affect the shape of the variation in a given place. The magnitude of the seasonal changes is proportional to the latitude of the location and is independent of the level of the magnetic activity. The mobility of the curves of the disturbed daily variations of the declination increases with increasing activity.

The amplitude of the variation increases with increasing geographic latitude of the location (Figure 45). The amplitude of the disturbed daily variations in the declination depends noticeably on the magnetic activity only at high latitudes. In days with moderate magnetic activity (according to the 3-ball characteristic of the day: 2 -- greatly disturbed, 1 -- moderately disturbed, 0 -- quiet) the disturbed daily variations of the declination have values of ± 30 minutes in individual hours of the day starting with latitudes of 60 degrees and farther north (Figures 46, 47).

Disturbed Daily Variations of Horizontal Component

These variations represent a simple wave with a single maximum and a single minimum in the day at approximately 1800 and 0500 respectively (Tables 40 and 41; Figures 41, 42). The disturbed daily variations of H experience a double inversion in shape within the boundaries of the Soviet Union; one in the belt of the geographic latitudes 45 to 60 degrees, the other in the 77 to 79 degree latitude belt, and consequently if a maximum in the variation occurs at one latitude, the minimum occurs at the same time at the other latitude.

The higher the magnetic activity, the more southerly the inversion. The inversion also depends on the longitude of the place: the greater the longitude, the more southerly the first inversion, and the smaller the longitude, the more southerly the second inversion (see Figures 52, 53). The inversion in the shape of the variation depends on the season of the year. In the summer it occurs at more southerly latitudes than in the winter and in the equinox.

The greater the magnetic activity, the greater the mobility of the curve of variation. Seasonal changes affect both the shape and the magnitude of the variation. The magnitude of the seasonal differences in the north is closely related to the latitude of the location: the differences increase within 62 to 73 degrees, and decrease above 75 degrees with increasing latitude. Below 62 degrees the seasonal differences remain constant up to the southernmost latitudes of the Soviet Union, maintaining a magnitude on the order of 10 to 15 gammas. In middle latitudes the magnitude of the variation amplitude is almost constant. In polar latitudes it rises sharply up to a latitude of 70 degrees, and then again diminishes.

In years of low magnetic activity in the winter and in the equinox the amplitudes of the disturbed daily variations of H at polar latitudes are considerably greater than in years of maximum activity (Figure 45). In years with moderate characteristic of magnetic activity the disturbed daily variations in H have a magnitude on the order of ± 15 gammas (and greater) south of the 45 degree latitude and north of the 60 degree latitude. In transition zones, where the shape of the variation becomes inverted, the disturbed daily variations in H are practically absent (Figures 48, 49).

Disturbed Daily Variations of Vertical Component

The disturbed daily variations of the vertical component represent a simple wave with a single maximum and a single minimum in the day. The maxima and minima occur at 1700 to 2000 and 0200 to 0700 respectively in all the latitudes under consideration (Tables 42, 43, Figures 43, 44). The form of the variations changes with the geographic latitudes and experiences at 63 to 65 degrees a complete inversion. The form of the variations is independent of the longitude (see Figures 52, 53). The seasonal changes are very large in the north and disappear fully south of 47 degrees latitude. The magnitude of the variations increases with increasing magnetic activity.

The greater the magnetic activity, the greater the magnitude of the seasonal changes. In years of low magnetic activity the amplitude of the variations increases continuously starting with 50 degree latitude to the north, and in years of high magnetic activity the amplitude decreases north of 75 degrees (see Figure 45).

In days of moderate activity the disturbed daily variations in Z have a magnitude on the order of ± 20 gammas in individual hours of the day, only up to a latitude of 55 degrees (see Figures 50, 51). Given below are charts (average for the year) of the isograms of the disturbed daily variations in H, Z, and D for days with a 3-ball characteristic of 2 and 1 (Figures 54 through 56). To obtain these variations for the individual seasons it is necessary to multiply the data of the isograms for the year by corresponding coefficients, located in Table 44.

Conclusions

1. The form of the disturbed daily variations of 3 elements (D, H, Z) of the earth's magnetic field is that of a daily wave with one maximum and one minimum per day.

2. The form of the variations remains constant in a given location for years of equal activity.

3. The form and magnitude of the variations vary in a definite relationship to the magnetic activity.

4. Within the belt of geographic latitudes from 40 to 80 degrees the form of the variations depends on the geographic latitude.

5. The form of the variation experiences a complete inversion for the declination and for the vertical component at a 60 to 62 degree latitude, and for the horizontal component at latitudes 45 to 60 degrees and 77 to 79 degrees.

6. At any latitude within the belt under consideration the maximum positive and negative deviations of the disturbed daily variations from the average daily values of D, H, and Z are approximately equal.

7. The amplitudes of the disturbed daily variations within the latituded belt under consideration increases from the south to the north from 25 to 350 gammas in H, from 6 to 300 gammas in Z, and from 2 to 126 minutes in D, and has a substantial value in days with moderate magnetic activity at latitudes north of 60 degrees.

8. The values of the disturbed daily variations within the boundaries of the USSR can be characterized by the following data.

Latitude	D		H		Z	
	max. year	min. year	max. year	min. year	max. year	min. year
from 40 to 62-66°	from ± 1.3' to ± 5.0	± 1.5' ± 5.0	± 10γ ± 15	± 10γ ± 15	± 5γ ± 50	± 4γ ± 20
62-66°	from ± 7.0 to	± 4.0	± 100	± 150 ± 200	± 40 ± 50	± 70 ± 30
north of 66°	from ± 30.0 to ± 63.0	± 10.0 ± 50.0	± 50 ± 250	± 50 ± 200	± 70 ± 200	± 70 ± 150

In conclusion let us note briefly the most characteristic features in the geographic distribution of the disturbed daily variations over the entire earth.

The field of the disturbed daily variations depends with greatest definiteness on the latitude. If we examine its distribution over the entire earth, the dependence is more clearly pronounced with respect to the geomagnetic rather than the geographic latitude.

The northern component (and also in first approximation the horizontal component) of the variation changes its sign approximately at the geomagnetic latitude of 72 degrees, and reaches its maximum value in the zone where the polar lights have their maximum frequency, and again changes sign near the geomagnetic latitude 55 degree and becomes very small and almost equal in value over all lower latitudes. This component of the variation has its maximum value in the morning and evening hours.

The eastern component (and in most places also the declination) of the variation is large in the polar region within the zone of the maximum frequency of polar light, changes its sign in the zone, and remains small in the remaining latitudes.

The vertical component of the variation is large and has a pronounced maximum in the morning immediately within the zone and a small minimum immediately outside the zone. There are also a maximum and minimum in evening hours, but these are of opposite signs compared with those of the morning. The vertical component of the variation changes sign at the equator, and is relatively small in middle and low latitudes.

The disturbed variations change the most with the seasons in high latitudes, where these variations are small in the winter and large in the summer.

CHAPTER VI. APERIODIC GEOMAGNETIC VARIATIONS DURING THE TIME OF STORM

As was already noted in the introduction, the aperiodic geomagnetic variations during the time of storm are frequently called in foreign literature the storm-time variation, and unfortunately the Russian literature also calls them so far "storm-taym" variations in imitation. It is better to call them, as above, the aperiodic geomagnetic variations in time of storm.

A description of the aperiodic variations is contained in a recently published American work (31); however, the data given there for the USSR territory are very incomplete, and therefore this work can not be recommended for study and calculation of these variations in the territory of the USSR.

The above-mentioned work also contains information concerning the foreign literature on the problem, but as far as Russian literature goes, there has been no such literature on this problem so far.

Used in this chapter were observation materials for 11 years (1938 to 1948) for middle-latitude magnetic observatories of the USSR, and in addition, the materials from the Arctic observatories for a smaller number of years.

As noted in Chapter V, the aperiodic variations are a component part of the field of the magnetic storm, forming together with the disturbed daily variation a regular portion of the field of the magnetic storm.

To derive the aperiodic variations, the average hourly values of the magnetic elements, pertaining to the series of first 28 hours (3 hours before the storm) of the magnetic hours were taken. Table 1

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indicates the materials from the magnetic observatories employed below.

The magnetic storms are classified by the amplitudes of the changes of the magnetic elements during the time of the storm, by the duration, by the variability or "mobility" of the magnetic elements, and also by the type of their start. Certain storms start gradually, others suddenly (with a sharp change in the value of the earth's magnetic field). A gradual start of a storm can be determined with an accuracy within one hour, while an instantaneous one can be determined with an accuracy to within one minute, using the conventional magnetograms, in which one hour corresponds to 20 mm. Ninety-one magnetic storms with sudden starts were recorded during 1938 to 1948. These storms are the ones used to calculate the aperiodic variations described below.

Each of these storms was classified in one of 3 categories (moderate, intense, and very intense storms) principally in accordance with the amplitudes of the storms occurring in Sverdlovsk. The aperiodic variations were calculated for each of these 3 categories of storms and in addition calculations were made not only for the averages of all the storms (year), but separately for storms occurring during the winter (January, February, November, December), summer (May, June, July, August) and equinox (March, April, September, October). The number of storms for which data were used in these calculations characterizes the degree of comparability of various results (Table 45). In addition, to obtain the most comparable results for middle latitudes, the aperiodic variations were calculated for various categories of storms from the same number of storms, with the exception of the aperiodic variations over all 3 categories of storms for the Vladivostock observatory, and with the exception of the aperiodic variations for very intense storms for Yakutsk. These types of aperiodic variations were obtained with less plentiful material. Particular care was taken in the calculation of the aperiodic variations from data of the Arctic observatories to check the validity of the results, and for this purpose the aperiodic variations were calculated not only for all the storms, but individually for the odd and even storms (all storms were numbered in sequence), and also for 2 groups of storms, one containing all storms numbered 1 to 25, the other all numbered 26 to 49.

The usual manner of computing the aperiodic variations, known in the literature, is as follows. One averages the observed magnetic variations (average hourly values of the magnetic element) for a sufficiently large number of magnetic storms, whereby the averaging is carried out over time measured from the start of the storm. One averages the data on all the storms pertaining to the hour prior to the start of the storm, to the first hour of each storm, to the second hour of each storm, etc. The first average of course pertains to the hour prior to the start of the storm (to the zero hour of the storm), the second to the first hour of the storm, the third to the second hour, etc. This method is based on the fact that storms begin at all different times as measured by local time, and if one uses the described method of averaging of the data of a large number of storms, the beginning of which occurs at different hours of the day, all other magnetic variations (quiet, disturbed, etc) are eliminated from the averages.

The information cited here on the aperiodic variations are based on results obtained in a different manner: the quiet and disturbed daily variations were first eliminated from the data of the observations pertaining to the individual storm, and the remainders, pertaining to different storms, but to identical hours counted from the start of the storm, were then averaged.

This method made it possible to determine satisfactorily the aperiodic variations by analyzing a smaller number of storms than required for the first method.

It was taken into account in these calculations that the disturbed daily variations added to the quiet daily variations equal the daily variations for disturbed days. Therefore, the aperiodic variations were determined by subtracting the corresponding daily variations for disturbed days from the data pertaining to the individual storms. The resulting remainders were then averaged with respect to time measured from the start of the storm. This yielded the storm-time variations for all middle-latitude observatories. To obtain the aperiodic variation of the high-latitude observatories, the disturbed daily variations averaged for 1937 were eliminated from the average hourly values of the storm-time elements. The quiet daily variations, being relatively small at high latitudes compared with the disturbed daily variations, were disregarded.

We shall not dwell in detail on a description of the aperiodic variations in all the elements (D, H, Z, X, Y), since the tables and particularly the graphs are sufficiently self-evident. Let us note only the very essential features in the morphology and geographic distribution of the aperiodic variations.

The most characteristic in shape and significant in magnitude is the variation in the horizontal component (H) of the earth's magnetic field. The aperiodic variations in H have the following form (Figure 57, Tables 47 through 50): in low and middle latitudes at the start of the storm (1 to 2 hours) it increases compared with its value prevailing prior to the storm. Then, a rapid decrease in H during 5 to 7 hours, changing into a slow decrease, which continues approximately another 15 hours, and within 22 to 24 hours after the start of the storm (after reaching the values that are smallest compared with those prior to the storm) H begins a gradual return to the values prior to the storm. This return extends for several days, and since the returns are usually limited to a period during which the irregular fluctuations of the field, comprising the so-called irregular portion of the storm field, are noted, this gradual return is seen even in days that are quiet in the magnetic sense, in the form of the so-called noncyclic magnetic variation. In other words, the noncyclic magnetic variation is that aperiodic variation that occurs outside the time limits of the magnetic storm. In this handbook the noncyclic variation is utterly disregarded, and the description of the aperiodic variations is limited to the first 28 and sometimes to the first 52 hours of the magnetic storm.

Tables 55 and 56 give the extremal values and amplitudes of the aperiodic variations in H for all the observatories. The form of the storm-time variations in H changes sharply in the transition through the latitudes of the zone of maximum magnetic activity or the zone of maximum frequency of polar lights (in the transition through the geomagnetic latitude of 67 degrees). This change in form is evident not only in the aperiodic variations averaged over many storms, but also in the aperiodic variations calculated by us for individual storms.

The form of the aperiodic variations in the vertical component (Figure 59, Tables 51 and 52) in middle latitude is the inverse of the form of the aperiodic variations in H. Even at the geomagnetic latitude of 50 degrees the form of the aperiodic variations in Z becomes more complicated, and it can no longer be considered as the inverse of that in H, since it is characterized in the average by a decrease in the values during 10 hours from the start of the storm and then by an increase in the values of Z, exceeding the values prior to the storm. While the form of the aperiodic variations in Z remains unchanged in lower latitudes up to the geomagnetic latitude of 40 degrees for all categories of storms and for all seasons, this picture changes starting with the 40 degree geomagnetic latitudes. Particularly unique is the form of the aperiodic variations in Z during the time of very intense storms.

Tables 57 and 58 give the characteristic quantities for the aperiodic variations in the vertical component.

The amplitude of the aperiodic variations in the declination (D) does not exceed 14 angular minutes at all latitudes from Yakutsk southward. The form and magnitude of the change in the aperiodic variations depends on the value of D at the location of the observatory. This dependence is particularly clearly seen if the curves of the aperiodic variations for the various observatories are arranged in order corresponding to the magnitude of the angle ω between the magnetic and geomagnetic meridians, i.e., in the following order: Yakutsk (ω = -24 degrees), Vladivostok (-18 degrees), Irkutsk (1 degree), Tashkent (14 degrees), Tbilisi (18 degrees), Kazan (25 degrees), Sverdlovsk (26 degrees) (see Figure 60; Tables 53 and 54). The forms of the aperiodic variations in X and Y are similar to those of H and D respectively (Tables 61 through 64).

(Let us recall that the direction of the magnetic meridian is that direction in which is located the horizontal component of the earth's magnetic field in a given locality, while the geomagnetic meridian is a great circle passing through the given point and the 2 geomagnetic poles, the northern and southern. The systematization of the curves D_{st} with respect to ω was proposed by L. G. Mansurova.)

The forms of the aperiodic variations of the horizontal component were interpolated graphically for every 5 degrees of geomagnetic latitude. The results are shown in Table 65 and Figure 61. The use of this table is recommended for the determination of the aperiodic variations in H at those latitudes, at which there are no magnetic observatories.

In spite of the relatively complicated method of determining the storm-time variation, there is no doubt that it is an actual component part of the field of the magnetic storm, and not a result of formal calculations. The magnetograms show a clear presence of the aperiodic variation (in particular in H) of the form described above in many storms. However, it must be indicated that the rapid and on first glance disorderly fluctuations of the earth's magnetic field, occurring during the time of storms and forming the third component portion of the field of the storm (its irregular portion) mask the presence of the aperiodic variations, particularly at high latitudes (and especially in the Arctic), to such an extent that it becomes understandable why certain investigators do not accept the aperiodic variations as being a real portion of the field of the storm.

It follows from the graphs of the aperiodic variations that the magnitude (amplitude) of the aperiodic variations depends in a definite manner on the magnetic activity (intensity of the storm). The form of the aperiodic variations of the magnetic-field components is sufficiently stable, as follows from an examination of the data for individual seasons and storm categories, and changes only somewhat with the latitude. The dependence on the geomagnetic latitude is simpler than that on the geographic. The simplest dependence of the aperiodic variations is that on the angle ω between the magnetic and geomagnetic meridians.

CHAPTER VII. MAGNETIC ACTIVITY

Concepts from the field of problems of magnetic and solar activity were already encountered several times in the preceding chapters of this handbook. It was indicated that the physical causes of the cyclic variations (Chapter I) can be due only to changes in the solar activity. It was noted that the causes of the semiannual component of the annual variations are assumed to be the semiannual variations of the magnetic activity (Chapter III). Later, some information was given concerning the dependence of the annual variations on the solar activity. In the chapter devoted to the solar-daily variations, the material concerning these variations was given for 2 categories of days: quiet, i.e., with a low level of magnetic activity, and disturbed, i.e., with a high level of magnetic activity (Chapter IV). Attention was called in the same chapter to the question of the dependence of the daily variations on the level of the magnetic activity. Finally, 2 chapters (V and VI) are entirely devoted to 2 types of regular geomagnetic variations (disturbed daily and aperiodic storm-time), forming jointly the regular portion of the field of magnetic storms, the strongest manifestations of magnetic activity.

Thus, one encounters the phenomena of magnetic activity in the consideration of almost all known regular geomagnetic variations. In the preceding exposition, however, we did not encounter a definition of this concept, which was described indirectly and partially. For further exposition it is necessary to give a definition of this concept.

It can be defined in such a manner: The magnetic activity or disturbance is that aggregate of changes in the earth's magnetic field, which is caused by corpuscular radiation from the sun.

Since magnetic activity is totally absent only in a relatively small number of days (and according to some opinions it is never absent at all) it follows that the earth is almost continuously under the influence of the corpuscular radiation from the sun. Therefore, the corpuscular streams, which cause the magnetic storms, as explained above, must be recognized as the strongest manifestation of the corpuscular radiation of the sun, assuming that even when the earth is outside the streams, its magnetic field interacts with the less dense clouds of solar corpuscules.

We must immediately call attention to one very important feature of the magnetic activity. If we consider, for example, the daily geomagnetic variations for quiet days, we can always choose at least a few such days, for which the daily variations are clearly noticeable even on the magnetograms. Therefore, the form of these variations, found by averaging and expressed by means of the graph, is a sufficiently close representation of these variations. The same, with some modification, can be said concerning the annual variations: being calculated, they are sufficiently well represented by suitable graph or table. The changes in the magnetic field produced by the corpuscular radiation from the sun, i.e., the magnetic activity, are so various in form and magnitude, that they are practically impossible to describe by some sort of averaging of the curves of the magnetograms or of the tables of the average hourly values. Such tables, upon proper analysis, can yield material on the regular portion on the field of the magnetic storms (on the disturbed daily variations or on the aperiodic storm-time variations), but this regular portion far from exhausts the entire variety of manifestations of magnetic activity. This is why, for already a long time, one employs in the description and study of magnetic activity the so-called "magnetic characteristics." The principal purpose of magnetic characteristics is to permit a quantitative study of the laws of magnetic activity. Many various magnetic characteristics were proposed at different times.

A relative estimate of the magnetic activity for various years can be obtained by comparing the number of magnetic storms during these years. This simple method is coarse, but nevertheless it makes possible discerning the presence of periodic rises and falls in magnetic activity, closely corresponding to the 11-year periodic fluctuations in the number of sunspots. The characteristic proposed by N. P. Ben'kova takes into account not only the number but also the intensity of the storms:

$$D = 1,5N_1 + 4N_2 + 8N_3$$

where N_1, N_2, and N_3 denote the annual number of moderate, intense, and very intense storms, respectively. The coefficients in front of them are chosen approximately proportional to the average amplitudes of the storms of the 3 mentioned categories. This characteristic, as well as the annual number of storms itself, is suitable for estimating the magnetic activity only for large time intervals, not less than one year.

Another means of estimating is based on determining the variability of the average daily values of the horizontal component H. The changes from one day to another are summed, without regard to the sign, for the entire estimate interval, for example a month, and are averaged. The average day-to-day variability u(H), expressed in gammas, characterizes the magnetic activity in the time interval under consideration, since other day-to-day changes, due to other reasons (secular trend), are negligible. The disturbing magnetic field of the streams of solar corpuscules that move in space near the earth may have a variety of orientations at any given time, but on the average it must orient itself along the geomagnetic axis. One can deduce from this that at various points of the earth the variability of the horizontal component from day to day should be proportional to the cosine of the angle β between the directions of the horizontal component and that of the geomagnetic axis. In this case the value of $u(H)/\cos\beta$ should be uniform everywhere and should serve not as a local, but as a world (planetary, or global) characteristic of magnetic activity. It is known as the u-measure and in practice is calculated from the following equation

$$u = \frac{0.1\,u(H)}{\cos\Phi\cos(\psi - D)},$$

where Φ is the geomagnetic latitude of the observatory, ψ the angle between the geomagnetic and geographic meridians, u(H) the day-to-day variability in H in gammas; the coefficient 0.1 is used to make the u-measure expressible in numbers on the order of unity.

Experience in using this characteristic has shown that the results of calculating the u-measure from data of various observatories in moderate and low latitudes are in sufficiently good agreement, but this agreement is strongly violated in polar observatories (11).

The values of the u-measure for each month, starting with 1872, were calculated by Bartels. Annual values were calculated also for earlier years (starting with 1835), although in an indirect manner (24). The advantage of the u-measure is its objectivity; its shortcoming is that it can not be applied to evaluate the activities of individual days, and generally, of short time intervals.

The simplest method of evaluating the magnetic activity of an individual day is to review the magnetograms and estimate by eye the waviness of the record line for the field components using the following approximate scale, consisting of only 3 steps:

Field	Balls
Quiet	0
Moderately disturbed	1
Greatly disturbed	2

Due to the fact that the magnetic activity changes over a very wide range, the breakdown of the days into the above 3 types involves no particular difficulties and requires no great experience; however, the estimates made by different persons with identical magnetograms may differ quite frequently.

The method described, in spite of its subjectivity, has found wide application. It turned out that the number of balls estimated for the days in different observatories frequently agree quite well with each other, and the average of the estimates of several dozens of magnetic observatories over the entire earth sphere, calculated with an accuracy to within 0.1 ball, can be taken as a global characteristic of the magnetic activity of the particular day. Such average "international ball characteristics," according to the resolution of the International Geodetic and Geophysical Union, were published by the Dutch Meteorological Institute and are available for every day, starting 1 January 1890 (27). The daily ball characteristics from 10-15 magnetic observatories of the USSR are regularly prepared in the USSR by the Scientific Research Institute for Terrestrial Magnetism.

The 3-ball characteristics are good for the investigation of changes in activity from day to day; they have also been successfully applied to shorter intervals. Thus, hourly 3-ball characteristics were required to study the daily course of the magnetic activity (10, 16).

The subjectivity of the 3-ball scale does not guarantee uniform estimates over long periods of time, because even the same person is inclined to assign a different number of balls to the same level of activity and different sections of the 11-year cycle of activity, and also because with time it becomes necessary to change personnel, equipment, and the number of participating observatories. Comparison of ball characteristics for time intervals that are far apart gives therefore less reliable results.

A new characteristic of magnetic activity, called the K-index (25) was proposed about the year 1939. Thanks to its objectivity and to the greater subdivision of the scale, which contains 10 balls from 0 to 9, the K-index is preferable to the 3-ball characteristic, in spite of a certain complexity and artificiality in the method used to obtain this index. The K-index is suitable to the evaluation of sufficiently short interval, viz., 3 hours. We shall describe here the method of determining the K-index only in main outlines: details can be found in an article by N. P. Ben'kova (4).

A 3-hour interval is separated on the magnetogram, and one finds within it the amplitude R of the fluctuations due to the activity of the magnetic field. The fluctuations resulting from the normal daily course should be disregarded, since they do not pertain to the magnetic activity. The amplitude R is therefore determined as the difference between the maximum and minimum deviations of the recording from the normal curve of the quiet daily course in the selected 3-hour interval. Having determined the amplitudes of all 3 components of the field and having expressed them in gammas, one selects the highest one, and a conversion is made from the highest values to the K-index using a special scale. This scale varies with the observatory. Initially it was given for the Nimek observatory in the following form:

Amplitude R in gammas			K-index
from	0 to	4	0
	5	9	1
	10	19	2
	20	39	3
	40	69	4
	70	119	5
	120	199	6
	200	329	7
	330	499	8
	etc	500	9

The scale is approximately logarithmic in its middle portion; at the start of the scale the index increases by one when the amplitude doubles; at the end of the scale the index increases by one when the amplitude is increased by 1-1/2 times.

Since the amplitudes of the disturbances in general increase from the equator towards the polar zones, it becomes necessary, in order to obtain uniform values of the K-index (so as to impart to it a value of a global rather than a local characteristic), to extend or compress proportionally the scale given above by multiplying all the numbers in the amplitude column by a suitable number selected for each observatory. Thus, for Tashkent, the amplitude boundaries of all the balls are reduced in a 3:5 ratio, and the lower boundary of ball 9 is assumed to be 300 and not 500 gammas. The scales of the K-index adopted for the USSR observatories are shown in Table 69.

The uneveness in the steps of the K-index scale, which broaden towards the top, is advantageous: this uneveness takes into account the fact that disturbances having large amplitudes are considerably less frequent than those with small amplitudes. At the same time, however, the uneveness of the scale makes obscure the sense of the average values and makes it difficult to compare any statistical calculations. In view of this, the author of the K-index has suggested the calculation of the daily index not by simply averaging the eight 3-hour indices, but using a more complicated manner. However, this complication was not adopted in practice.

The following tables employ only the u-measure, the 3-ball characteristic, and the K-index, described above. Other measures for geomagnetic activity, in addition to the widely used ones described above, were also proposed.

A certain idea concerning the disturbances of the magnetic field during the day is obtained from the daily amplitudes of the fluctuations of its components or from some combination of these amplitudes. Such, for example, is the "numerical magnetic characteristic," proposed by Mitchell:

$$\frac{HR_H + ZR_Z}{10000}$$

where the quantities H and Z and their daily amplitudes R_H and R_Z are expressed in gammas. Observatories recording the component X, Y, and Z computed a characteristic using the equation $(XR_X + YR_Y + ZR_Z)/10,000$. The numerical magnetic characteristic does not make it possible to estimate the activity of time intervals shorter than a day. In addition, it mixes up 2 different phenomena, since the daily course is calculated in this characteristic in an equal manner with the magnetic activity.

The effect of the normal daily course can be eliminated in quite a simple manner, using the "absolute storminess" proposed by Birkeland and calculated for any field component, and representing the average of the absolute values of the deviations of the individual hourly values from the average values for the same hour, obtained for several quiet days within the same month.

P. I. Gusev (9) proposed that the lengths of the curve on the magnetogram be measured for each hour and compared with the length s_0 of the curve of the normal course for the same hour. The quantity $w = s^2 - s_0^2$ characterizes the activity for that hour. A. P. Nikol'skiy used the length of the curve on the record of the magnetic declination (17) as a measure for the activity.

The Tashkent magnetic observatory has been employing since 1941 the rate of change of the horizontal component as an objective measure of activity (14).

The variety and imperfections of the activity characteristics makes difficult comparison and generalization of various investigations. Not one of the characteristics gives the full picture of the magnetic activity. The results obtained with the aid of different characteristics sometimes contradict each other, particularly with respect to details of the geographic distribution of magnetic activity, and its daily and seasonal behaviors. It is enough to recall that the hour-to-hour variability of H, which is the basis of the u-measure, decreases with increasing distance from the equator, while the 3-hour amplitudes, which are the basis of the K-index, increase.

The search for a measure of activity which would give a sufficiently full description of magnetic activity is still an unsolved problem.

Principal Features of Magnetic Activity

The most general and reliable conclusion from the numerous investigations of the magnetic activity is the presence of a connection between the activity and the solar activity. One of the manifestations of the latter is the approximately periodic fluctuation in the number of spots appearing on the surface of the sun. The period of this phenomenon is on the average 11 years. The same period is clearly seen in the magnetic activity: everywhere on the earth's sphere the magnetic disturbances become more frequent in years with large numbers of sunspots and become less frequent in years with small numbers of spots. The maximum of magnetic activity usually occurs 1 or 2 years after the maximum of the sunspots.

The characteristic feature of the magnetic activity is the already-noted tendency for the storms to repeat at approximately equal time intervals, corresponding to the apparent rotation of the sun about its axis, i.e., approximately 27 days. Evidently, the repetition of the disturbances is related to the fact that every 27 days the same region of the solar surface is turned towards the earth (14). The question of the 27-day repetitiveness of the storms will be considered in detail below on the basis of materials contained in a storm catalogue, compiled for this handbook.

The seasonal fluctuations of the geomagnetic activity exhibit a pronounced semiannual wave with maxima near the equinoxes and minima near the solstices. Two explanations are proposed for this phenomenon. The angle between the direction of motion of the corpuscules flowing from the sun to the earth and the geomagnetic axis may reach 90 degrees close to the equinox and diminish towards the solstices. The magnitude of this angle affects the depth of penetration of the corpuscules into the earth' magnetic field -- the "equinox effect." The second explanation proposes that the intensity of the corpuscular radiation from the sun is smaller in the plane of its equator than in the sunspot zones located on both sides of the equator. The earth intersects the plane of the solar equator twice a year, approximately on the fifth of June and fifth of December. The minima of the geomagnetic activity should be observed during that time. The observed phase of the semiannual wave corresponds apparently more closely to the first explanation. It is possible that both causes are in operation.

As a result of the ellipticity of the earth orbit, it is closest to the sun in the beginning of January. During that time the solar radiation incident on the earth's sphere is 6% greater than during the maximum distance from the sun, in the beginning of July. Consequently, the magnetic activity should be higher. However, this fluctuation is easily masked by others in view of its slight value.

The geographic distribution of the magnetic activity is in general outlines symmetrical with respect to the geomagnetic equator. The maximum activity is observed in the 2 above-mentioned annular zones at geomagnetic latitudes of approximately 68 to 70 south and north. The activity diminishes slightly from these zones towards the magnetic poles. The activity diminishes towards the middle latitudes, first very strongly, but then more slowly from the 60 degree latitude to the equator. When the magnetic activity increases during the storm time, the radius of the above-mentioned annular zones increases, i.e., they become somewhat wider and so to speak shift towards the lower latitudes.

The changes in activity at all the observatories of the moderate and low latitudes exhibit a close parallelism, while the agreement between these changes and the course of activity at the polar observatories is not very great. The same holds for the distribution of activity over the time of the day, i.e., the daily course of the activity represents a more homogeneous picture in moderate and low latitudes, differing considerably from that for polar latitudes.

The daily course of the magnetic activity has been a subject of many investigations, but it is difficult to compare them because of the variety in the measures of activity employed. The most complete summary is contained in the work by N. P. Ben'Kova (8).

Examining the daily course of the magnetic activity in moderate latitudes, one can note that the observed distribution of activity over the hours of the day depends on the local solar time: morning hours are quieter, and afternoon and evening hours are more disturbed. Attempts were made to subdivide the daily course of the magnetic activity into 2 portions: one depending on the local time, the other on the world time; these attempts however have not yielded any conclusive results to date.

The type of the daily course of magnetic activity depends on the season: the maximum activity occurs in the summer in afternoon hours, and in the winter at the start of the evening; there is a less noticeable shift in the minimum of activity. Close to the equinoxes there is a relatively rapid transition from the summer type of daily course to the winter type and vice versa.

The level of activity exerts a certain influence on the form of the daily course: its amplitude increases in greatly disturbed days, and this increase is more noticeable in the winter than in the summer. The daily course of activity is weakly pronounced in the quietest days, and its form changes considerably, for the variability of the normal daily course of the magnetic field, not being related to the fluctuations of the corpuscular radiation of the sun, becomes more noticeable in the absence of disturbances, and therefore the maximum activity shifts towards mid-day (15).

The effect of the geographic locality on the daily course of the activity manifests itself in a certain lag in the maximum and minimum with increasing latitude. This is the character of the daily course of activity in moderate latitudes.

In the equatorial zone the maximum of the daily course of activity is observed near noon, and the minimum early in the morning or evening. In some places one observes a secondary evening maximum.

The peculiarities of the daily course of activity in polar regions have not yet been sufficiently studied (8, 18). Above the 78-degree geomagnetic latitude it represents a simple wave with a daily maximum, and between 70 and 78 degrees a transition type occurs with 2 maxima. The seasonal changes in the course are large and differ even in closely-located stations. In the summer the course approximates in form a simple wave with a daily maximum, in the winter a double wave with a lower amplitude and an unstable form.

Magnetic Activity in 1938-1948 As Per Data of Magnetic Characteristics

We already noted in the introduction that the 1938-1948 period covers the second half of one cycle of magnetic and solar activity and the first half of the next cycle. This is clearly seen from consideration of Table 66, which contains a series of averaged annual characteristics of magnetic and solar activity. It must be noted that of the 4 magnetic-activity characteristics tabulated in this table, the 11-year cyclic nature is shown most clearly by 2, viz., the number of magnetic storms and the u-measure. The average annual values of the 3-ball characteristic and of the K-index is less clear, but still exhibits this cyclic nature.

In Tables 67 and 68 are gathered the average monthly values of the 3-ball characteristics, averaged over 10 magnetic observatories of the USSR (in Table 67, from data of these middle-latitude observatories, and in Table 68, the same quantities, converted by multiplying with an experimentally-determined coefficient to a level corresponding to the average values of the data of 16 observatories of the USSR, including the 6 at high latitudes). In addition, the same tables contain the average values of the characteristics for 3 seasons of the year and for the yearly average.

Table 69 gives the values of the lower limit of the K-9 ball for many observatories of the USSR.

Table 70 gives the annual course of the magnetic activity from average monthly values of the K-index for 3 observatories (Srednikan, Kazan', Tashkent).

Table 72 contains the average monthly values of the K-index, derived from the data of these 3 observatories (for which the fullest data are available).

The average values of the K-index for individual observatories and the corresponding averaged 3-hour amplitudes of the magnetic disturbances are given in Table 70, reduced to the 11-year period of 1938-1948. Table 69 shows the number of years used in each observatory and also the K-index scale adopted.

The annual course of the magnetic activity is given in Table 71 and Figure 75 in the form of smoothed deviations of the monthly values of the K-index from the average annual values as a whole for the 11-year period, separately for Srednikov, Kazan', and Tashkent, and also as the common average for these 3 observatories. The smoothing was carried out using an equation of the following form:

$$\bar{a}_0 = \frac{1}{4} (a_{-1} + 2a_0 + a_1),$$

applied to 3 consecutive values of the deviations of the K-index (a_{-1}; a_0; a_1). Let us note that this very method of smoothing is used in many subsequent tables, the headings of which indicate that the data are smoothed. The average seasonal deviations are given for the 3 thirds of the year mentioned above: winter (January, February, November, December), equinox (March, April, September, October), and summer (May, June, July, August). Tables 73 and 74 and Figures 73 and 74 show the annual course of the magnetic activity for the average values of the K-index for 5 most quiet and 5 most disturbed days in the month. The typical double-peak curve with maxima at the equinoxes gives everywhere only the course for the disturbed days (Table 74 and Figure 74), whereby its amplitude exceeds approximately by 2 times the amplitude of the annual course for all the days (Table 71). The annual course for quiet days (Table 73 and Figure 73) is of another type, being somewhat different at different observatories: in Kazan', Tashkent, and Tbilisi it has a very small amplitude, but in the majority of the observatories it exhibits a single summer maximum and a single winter minimum; the equinox maxima in it are hardly noticeable.

The daily course of the magnetic activity is also uneven in quiet and disturbed days. It is represented in the form of the deviations of the K-index for the 3-hour intervals from the averaged daily value. The daily course over all days is given for 3 observatories having complete series of data (Srednikov, Kazan', Tashkent) in Table 75, 84, 93, and in Figures 62, 65, 68. The daily courses for the 5 quietest and 5 most disturbed days in the month are given in Tables 76-83, 85-92, 94-94, and Figures 63, 64, 66, 67, 69-72 for 9 observatories in a smoothed form, with a correction for the curvature of the general course of the activity.

This correction is intended to exclude the dependence of the type of daily course on the fluctuations of the activity from day to day. For this purpose, one finds for a selected category of days (A) the average level of activity, and in addition one finds the average level of activity for 2 groups of days neighboring to those of group A, viz., for the group of days preceding the days of group A (we shall call this the A_{-1} group) and for the group of days following the days of group A (we shall label these days A_{+1}). A smooth curve is produced from the 3 obtained values (A_{-1}, A, A_{+1}) and from this curve (parabola) one reads the corrections for each 3-hour interval in the days of the A category. The amplitude of the daily course of the magnetic activity in disturbed days is particularly great in winter, and diminishes somewhat in the summer, whereby the phases shift towards the earlier hours. In quiet days the amplitude of the daily course of magnetic activity is generally small and increases somewhat in the summer; no definite phase shift is noted. The daily course of the magnetic activity over all days is more similar in form to that of the disturbed days, but differs by having smaller amplitudes, which are almost the same in the summer and winter due to the relative increase in the daily afternoon maximum activity resulting from combining the disturbed and quiet days.

Magnetic Storms As Per Data of Summary Catalogue of Magnetic Storms

Prior to preparation of this handbook, several lists and catalogues of magnetic storms were prepared at different times. Each of these catalogues contained information concerning the magnetic storms, in accordance with results of observations made in any one magnetic observatory. The following catalogues are known: 3 Soviet ones -- based on data of the Leningrad observatory for 1878-1940 (5), Sverdlovsk for 1905-1942 (13), and Tashkent for 1937-1947 (21); and also 2 foreign ones -- Indian, based on data of the Bombay observatory for 1882-1905 (29) and British, based on data of the Greenwich observatory for 1874-1927 (29). The catalogue of this handbook contains information on magnetic storms for 1938-1948 and differs from all the above-mentioned catalogues in that it contains data on each storm not from one, but from 6 magnetic observatories. This is why it is called a summary catalogue. Table 1 gives the names and coordinates of the observatories, the data of which were used in the summary catalogue. It was compiled using both published catalogues, as well as catalogues compiled by individual observatories specially for this handbook.

(The Sverdlovsk observatory data were prepared by M. A. Lipina; the Irkutsk data by V. N. Vinogradova and N. A. Mishina; the Yuzhno-Sakhalinsk data by V. I. Afanas'yeva (for 1933-1946) and A. V. Timofeyev (1946-1948); and the Srednikan data by V. I. Afanas'yeva (1938-1948) and D. S. Slonimskiy (for 1947-1948).)

The summary catalogue includes all the storms causing in Leningrad declination amplitudes reaching not less than 150 gammas, or 35 angular minutes, or causing in Sverdlovsk not less than 80 gammas in Z, 100 gammas in H, and 120 gammas (25 minutes) in declination, or causing in Tashkent not less than 18 minutes in D, 120 gammas in H, and 40 gammas in Z.

Certain storms observed at other observatories were originally left out of the catalogues of these observatories, having been estimated as being weak disturbances. In all these cases the necessary supplementary information was ordered again from the observatories and entered in the summary catalogue. The following information is listed for each storm included in the catalogue: (1) serial number of storm in the catalogue; (2) serial number of storm in year; (3) world time of start of storm with accuracy to within the hour, if the start is gradual, and with accuracy to ± 2 minutes if the start is instantaneous; (4) world time of the end of the storm; (5) duration of storm in hours; (6) amplitudes of the elements -- declination (D) in minutes (the coefficients by which the catalogue amplitudes must be multiplied to convert the values of the declination amplitude, given in angular minutes, into values expressed in gammas, are listed in Table 96), the horizontal (H) and vertical (Z) storm-time components in gammas; (7) world time of the start of active period (if there were several active periods, the starting time of each is noted); (8) world time of the end of active period (or active periods); (9) letter symbol denoting the characteristic of the storm, using the following scale: moderate, intense, and very intense.

Information on the amplitudes and active periods are given in the catalogue separately for each observatory, and the information concerning the beginning and end of the storm are given in common for all the observatories. The time of beginning and end was determined by the author of this chapter taking into account the data from all catalogues prepared at the observatories, and taking into account a supplementary review made by the author of the magnetograms of the observatories in Leningrad (1938-1940), Yuzhno-Sakhalinsk, Srednikan, and Moscow. The instantaneous beginnings, as a rule, were noted by all observatories. The compilers have attempted to accept the end of the storm time as that time during which all the disturbances of the quiet variations, except for some small ones, have terminated, without taking into consideration whether or not the variations returned to the average level prevailing prior to the storm, for this return, as was noted earlier, extended over many additional days, which can be classified as quiet in all other respects. The letter symbols for the storms are based on a qualitative inspection of the magnetograms, taking into account the amplitudes of the storms and the rate of change of the field during the storms, but without any account whatever of the duration of the storms.

The catalogue contains data on a total of 318 storms, including 35 very intense, 75 intense, and 208 moderate. During the time interval covered by the catalogue there was an average of 29 storms per year, while the Indian catalogue contains approximately 14 storms, and the Leningrad one approximately 18 storms per year. This difference can be explained not only by the difference in choice of the lower limits of amplitudes included in the storm catalogue, but also by the fact that the 1938-1948 period contains 2 groups of years of high magnetic activity and only one group of years of low activity. In addition, the year 1943, which contains an anomalously large number of prolonged moderate disturbances, is included among the years of relatively low activity. Finally, the already-noted fact that the catalogue includes storms classified as weak at the southern observatories leads to the belief that the catalogue does contain a certain number of storms which would not be included in the catalogue, were it to be compiled in accordance with data of these southern and even more southerly observatories. Such storms are marked in the catalogue by a plus sign, and their total quantity is 65. We shall consider below certain regularities observed in the data contained in the catalogue.

One must remark furthermore by way of introduction that the amplitudes of the storms in the catalogue are in almost all cases the amplitudes of a certain single active period of the storm and the extreme (maximum and minimum) values of the elements are observed in the majority of cases within the storm one soon after the other.

Changes in the Number of Magnetic Storms Within the Activity Cycle

In different years of the activity cycle one observes, generally speaking, an unequal number of magnetic storms. The most common regularity is the fact that the higher the activity level in the year, the more magnetic storms in the year. We must stipulate here that the change in number of storms from year to year, although following closely the changes of the general level of magnetic activity, follows the changes in the solar activity only on the average. This can be seen from Figure 76, which shows the annual number of magnetic storms and the average-annual values of the relative sunspot number, which serves as a characteristic of the solar activity. The information on the number of storms for 1878-1937 are taken from the storm catalogue of the Leningrad observatory (5), while the number for 1938-1948 agrees with the summary catalogue appended to this handbook. The information for 1949-1951 is based on the data of the Moscow magnetic observatory. The 1878-1951 period covers more than 6 activity cycles. It is evident from the drawing, first of all, that a magnetic-activity cycle corresponds to each solar activity cycle. Also evident from the drawing is the fact long-known in the literature that cycles of different character alternate in pairs: the cycle with the higher maximum of solar activity is followed by a cycle with a relatively lower maximum of solar activity. The only exception to this regular alternation within the time interval under consideration is the current cycle, which starts with the low-activity years 1943-1944, inasmuch as the current cycle has a higher maximum activity in 1947 than the 1933-1943 cycle. The noted alternation of the solar-activity cycles corresponds to a peculiar alternation of the magnetic-activity cycles. The peculiarity lies in the fact that one cycle may have a steady increase in number of storms from the minimum annual value to the maximum one in the cycle, while the next cycle has an intermittent, unsteady increase in the annual number of storms. The cycles characterized by a steady increase in the number of storms to the maximum value in the cycle are the 1890-1901, 1913-1923, and 1934-1944 cycles. On the other hand, the 1902-1912, 1924-1933, and the current cycle beginning with 1944 are cycles of the second type noted above. Naturally, the characteristic given above is to some extent arbitrary and not quite strict. Finally, an examination of Figure 76 shows also the so-called secular change in the level of activity. This secular change is evidenced in the following: It can be seen from the figure that from 1900 to 1951 each later minimum of magnetic activity is characterized by an ever-increasing annual number of magnetic storms: in 1901, 2 storms; 1912-1913, 3 storms each; in 1923, 7; in 1934, 11, in 1944, 16 storms. A corresponding increase occurs from 1900 to 1951 in the maximum annual number of storms in the cycles, designated above as steady, having a steady character of increase in the number of storms in the cycle. Apparently the noticed secular change is related to the secular change in solar activity that can be seen in Figure 76 (22) (the 1934-1944 cycle, in particular, has a lower maximum of solar activity than the current cycle). The systematic shift in the maximum of magnetic activity within the cycle relative to the maximum of the solar activity (delay of the maximum of magnetic activity by 1 to 2 years), which was noted by several authors (26), can not be discerned clearly from Figure 76. One can also note that the secondary maximum in number of storms occurring in years in which the number of storms decreases in each cycle (1888, 1898, 1922, and 1943) may also have a nonrandom character. However, there are little data leading to a final conclusion that this is not a random phenomenon. This phenomenon is either entirely absent in the 1902-1912 cycle, or else it is so strongly pronounced in 1910, that indeed it determines the maximum annual number of the storms in this cycle.

Without this phenomenon the cycle might have had a maximum in 1908.

In characterizing the fluctuations of the annual number of storms during the cycle, it must be indicated that the amplitude of the fluctuation does not exceed 30 to 35 storms, for if, for example, approximately 10 storms were observed in years of low activity, one cannot expect more than 40 to 45 storms in any one year during this cycle. In the time interval under consideration the minimum number of storms occurred in 1901 and 1902 (2 each) and the maximum number (41) occurred in 1938. One can also note that there are no data with which to predict the character of the secular changes in activity for many years in advance.

Table 97 contains numerical material which characterizes the above exposition in detail.

In conclusion let us examine the changes in the annual number of storms of different categories occurring in 1938-1948. Figure 77 shows these changes for the 3 categories of storms employed in the summary catalogue. The annual numbers of storms are expressed as percentages of each category (100% corresponds to the number of storms within the corresponding category for the entire 11 years from 1938 to 1948). The changes have a maximum amplitude in the category of very intense storms (from 0.0 to 20.0%), and a minimum in the category of moderate storms (from 4.8 to 14.5%). This makes it possible to state that when the average activity level changes from a minimum to a maximum, the greatest change occurs in the annual number of very intense storms, and the minimum change occurs in the moderate storms. In other words, very intense storms are most unevenly distributed over the years, and are concentrated in years of high activity.

It is evident from Figure 78 that if we consider not all storms within each category, but only those that have sudden beginnings, one does not see the picture described above. In years of low activity there are no storms of any category with sudden beginnings and in years of high activity the storms of the various categories have an almost equal frequency (16 to 23%). Tables 98 and 99 contain the numerical data corresponding to Figures 77 and 78.

Change in Number of Magnetic Storms with Season

The frequency of magnetic storms is not the same for different parts of the year. The greatest number of storms occur during the equinoctial months. Figure 79 shows the number of storms occurring during different months of the year, as a percentage of the relative average annual number of storms. The most uneven distribution takes place for very intense storms (see also Table 100) and the moderate storms are the most evenly distributed. The uneveness in the distribution of the very intense storms can be explained by their relatively small number within the time interval under consideration and it is possible that if the period is longer the uneveness would become smaller. In 1938-1948 up to 12% of storms of all categories occur in March.

As to the storms with sudden beginnings, their seasonal distribution has certain peculiarities, as can be seen from Figure 80 and Table 101. One must particularly note that in 1938-1948 the greatest number of storms with sudden beginnings occurred in April (15%) and July (15%). The very intense storms with sudden beginnings also show the greatest uneveness in month-by month distribution. The causes are probably the same as those of the uneven distribution of very intense storms in general. In 1938-1948 more than 20% of these storms occurred in April. This result is not in exact agreement with the deductions contained in the literature (19), but neither does it contradict them.

Daily Course of the Beginnings of Magnetic Storms

One cannot speak of a daily course of magnetic storms, for on the average each storm lasts more than several days (see below). One can speak, however, of a daily course of the beginnings of the magnetic storms. This question has certain practical significance, and the data collected in the catalogue throw some light on the subject. It can be seen from Table 102 that taken as an average over the year most storms of all 3 categories, viz., moderate, intense, and very intense, begin between 0530 and 0830 world time (18.6%). This deduction is based on the data of the summary catalogue, i.e., on the data of Soviet middle-latitude magnetic observatories. An important question arises: what time -- world or local -- does the daily course of magnetic storms follow at various observatories? The literature on the subject contains a statement that the daily course of the beginning of magnetic storms follows local time. However, data by Soviet observatories for 1938-1948, which served as a basis of the summary catalogue, give a different answer to this question. According to these data one must assume that the daily course of the beginnings of magnetic storms follows world time. This deduction is noted already by examining the catalogues of magnetic storms compiled by various authors at different observatories. In fact, according to these catalogues, the greatest number of beginnings occur at approximately 2000 in Srednikan, approximately 1300 in Leningrad, 1200 in Sverdlovsk, approximately 1100 in Irkutsk, approximately 1700 in Yuzhno-Sakhalinsk, and approximately 2300 in Tashkent, all local time. Thus, the "dispersion" of the time of the maximum is 9 hours (20 - 11). If these hours are converted to world time hours, the dispersion decreases somewhat, and becomes 7 hours. Comparison of all these individual catalogues of storms with magnetograms, as made by the author of this chapter, has shown that the persons who determine the time of the beginning of the storm at the various observatories all had different approaches to this determination. Some authors, as a rule, took the time of the gradual beginning of the storm to be the appearance of a small disturbance, while others took the instants that are close to the beginning of the active periods (see below concerning active periods). Actually, however the magnetograms of all the Soviet observatories reviewed by the author of this chapter, as well as copies of magnetograms from several American observatories at the disposal of the author, show that it is possible to select one common instant of world time, which appears to be suitable for acceptance as the time of the beginning of the storm. It goes without saying that the sudden beginnings, giving no cause for subjectivism, were determined at all the observatories to be absolutely simultaneous.

One must conclude that the problem of whether the daily course of the beginnings of the storm follows local or world time was made obscure by the fact that the method used to answer this problem was to compare the catalogues of various observatories and of various authors, rather than comparing magnetograms of many observatories with each other. Nor were the earlier investigations on the subject made by Birkeland and Gauss taken into consideration.

The conclusion derived from the summary catalogue is as follows: the daily course of the beginnings of the storm has a maximum from 0600 to 0800 world time and a minimum from 1800 to 2400 world time.

From Table 102 it is seen that the distribution of the beginnings within the time of the day changes somewhat from season to season. In particular, more storms begin in the first half of the day in the summer than in the winter.

The daily courses of the beginnings of the magnetic storms, determined separately for various intensity categories of the storms (see Figure 81 and Table 103) demonstrate that there is no evident dependence of the shape of the daily course of the beginnings on the intensity of the storms. The difference exhibited in Figure 18 can be fully explained by the fact that in 1938-1948 the number of storms vary greatly with the category, and the number of intense and very intense storms was considerably smaller than that of the moderate ones.

As to the daily course of the sudden beginnings (Figure 82 and Table 104) of the storms, they are in general distributed quite uniformly over the hours of the day, but the number of beginnings occurring during the period from 1800 to 0600 world time is somewhat larger, amounting to more than 60% of all the sudden beginnings.

Duration of Magnetic Storms

Speaking of the distribution of the beginnings of the storm over the hours of the day, it is natural to dwell, if briefly, on the problem of the distribution of the ends of the storms over the hours of the day. Inasmuch as the effects of the magnetic storms do not vanish immediately in most cases, and some of them (the phenomenon of the gradual restoration of the average levels of fluctuations) extend even over several days which are principally free of irregular fluctuations, there is more subjectivity in the determination of the time of the end of the storm than determination of the time of the beginning. Reflecting this circumstance is apparently the fact that many storms are shown in the catalogues to end at hours that are close to the beginnings of the storms. One can think that this is the result of the tendency of the persons, who determine the end of the storm time, to make the end of the storm coincide with the end of a 24-hour period. Most probably this is based on a hidden thought that it is not desirable to carry over portions of the storm interval to a small fraction of the next day. This is why the handbook does not contain any numerical data on the distribution of the end of the storms with the hour of the day.

The same doubt concerning the determination of the end of the storm time makes any conclusion on the duration of the storm less reliable. These conclusions can therefore not be made with an accurary to within 1 to 2 hours and their best accuracy does not exceed 4 to 6 hours. The average duration of the storm during the 1938-1948 period is on the order of 5 days. The storms are somewhat shorter in summer months on the average than the winter-month storms (summer approximately 60 hours, winter approximately 70 hours). The shortest storms are found among the very intense storms (in summer months their average duration is approximately one day).

Active Periods of Magnetic Storms

Examination of the magnetograms makes it possible to separate within almost each magnetic storm one or several periods, lasting for several hours, during which the fluctuations of the magnetic field are particularly intense and disorderly. These periods are called "active periods of magnetic storms." To separate the active periods it is necessary to propose certain objective quantitative criteria and to perform this separation exclusively on the basis of examination of the magnetograms.

This, naturally, introduces a certain subjectivism, which thus far cannot be eliminated.

Active periods can be characterized by describing the daily course of their beginnings, their duration, and the interval of time from the start of the storm to the start of the active period. As to the amplitudes of the fluctuations of the magnetic elements during the time of the individual active periods, as a rule the amplitudes pertaining to one of the active periods are the amplitudes of the entire storm and there is no advantage in examining separately the amplitudes during the active periods.

Table 105 leads to the following conclusions: the daily course of the beginnings of the active periods definitely follows world time.

The majority of active periods (76%) begin in the time interval from 0700 to 1700 world time. Let us note in addition that the active periods in the more intense storms, as can be seen from a detailed examination of the summary catalogue, begin on the average in earlier hours of world time than do the active period of the moderate storms.

Proceeding to the question of the size of the time interval between the beginning of the storm and the beginning of the active period, it must be said (Figure 83) that this interval ranges most frequently from 1 to 6 hours. Only the data of the Irkutsk observatory show the active periods to begin 7 to 9 hours after the beginning of the storm. Owing to the already-noted subjective manner of establishing of the active period it is difficult to tell here how real this "delay" of the Irkutsk active periods is. It is possible that it is the result of subjectivity on the part of the persons who establish the period.

Finally, Figure 84 shows that the active periods last most frequently from 3 to 10 hours (5 to 6 hours in Srednikov, 5 to 6 hours in Leningrad, 9 to 10 hours in Sverdlovsk, 3 to 4 hours in Irkutsk, 7 to 8 hours in Yuzhno-Sakhalinsk, and 9 to 10 hours in Tashkent). Were there any simple relationships in the data of the various observatories between the latitude of the observatory location and the time, it could have been subjected to analysis, but since no such dependence can apparently be seen, these differences in time must also be attributed mostly to the individual approach made by different authors to the selection of the active periods.

It must also be noted that many storms contain several active periods, each frequently occurring at the same hour of successive days within the storm. All 318 storms of the summary catalogue exhibit active periods at least in one observatory. As was already noted, the amplitudes of the storm-time fluctuations of the magnetic elements are as a rule equal to the amplitudes of their fluctuation during the time of one of the active periods.

A certain idea concerning the distribution of the activity over various hours of the magnetic storm can be obtained in the following manner.

Seventeen consecutive values of the index K_i ($i = 0, 1, 2, \ldots 16$) were calculated for each of the 69 magnetic storms with sudden beginning, occurring in 1938-1948, starting with the value of K_0, relating to the 3-hour time interval preceding the 3-hour interval containing the beginning of the storm. Averages were then taken of the 69 values of K_0, the 69 values of K_1, etc up to the 69 values of K_{16}.

The results of these calculations were the quantities represented in Figure 85. It can be seen from this figure that the magnetic activity varies quite regularly during the course of the storm, provided it is characterized by means of the 3-hour intervals. The activity reaches its maximum value rapidly, within 6 to 9 hours from the beginning of the storm, and then decreases monotonically. This rapid increase in the average value of the index K corresponds only to the already mentioned circumstance, that most active periods begin not later than 6 hours after the beginning of the storm. To determine whether there is a definite connection between the distribution of the activity within the storm and the time of the year, the values of the indices K were averaged separately for 13 storms (from among those taken above) occurring in November, December, January, and February (winter), separately for 30 storms occurring in May, July, and August (summer), and separately for 26 storms occurring in March, April, September, and October (equinox). The results of these calculations are shown in Figure 85. It is clear from the figure that in winter months the maximum values of the activity are reached after the greatest number of hours from the beginning of the storm (approximately 14 hours), and in equinox this takes place after the smallest number of hours (5 hours). In addition, it is seen that the equinoctial storms are the most prolonged and the winter storms are the shortest. The distribution of activity in summer storms appears closest to the average annual distribution.

Finally, calculations carried out individually for storms of different categories, viz., moderate (i.e., those for which the amplitude of the changes in the horizontal component (H) of the magnetic field ranges from 100 to 180 gammas in Sverdlovsk), for intense (amplitude of H not greater than 300 gammas) and very intense (amplitude in H greater than 300 gammas) have shown that the activity during the time of intense storms (Figure 65) reaches its maximum the latest (approximately after 13 hours) and occurs fastest during the time of very intense storms (within 5 hours). In addition, during moderate storms, starting approximately 20 hours after the beginning of the storm, the change in activity becomes very small (one sees fluctuations about an almost parallel line).

Amplitudes of Fluctuations of Magnetic Elements During the Time of Magnetic Storms

The amplitudes of the fluctuations of the magnetic elements during the time of magnetic storms represent one of the important characteristics of the storm. Table 106 gives the averages of the amplitudes of all storms of each category for each year and for each of the 6 observatories. Examination of this material leads to the following conclusions: there is no definite relationship between the average amplitudes of the storms, by separate categories, and the average level of activity. This is natural, for the storms were classified in the catalogue into 3 wide categories (moderate, intense, and very intense) based indeed on their amplitudes. There is, on the other hand, a pronounced dependence of the amplitudes on the latitude of the location of the observatory. As a rule, the farther south the observatory, the lower the amplitudes of storms of all categories at the observatory. Among the observatories used to obtain data for the summary catalogue,the average amplitudes are 2 to 3 times smaller (and sometimes even by a larger factor) in the southern observatories than in the northern ones.

Figure 86 to 88 show the maximum storm amplitudes for each year and for each observatory. It is seen from these figures that in years of relatively low activity the storms have as a rule smaller amplitudes. Although there is no strict dependence, nevertheless it can be said that in years of low activity very intense storms are less probable than in years of high activity. A result of the fact that storms occur most frequently in equinoctial months (see above, and also Figure 79), it appears that on the average the storm amplitudes recorded for these months are numerically greater.

There is no definite relationship between the amplitude of the storm and the duration of the storm, but it can be noted that storms of very great duration and simultaneously of very large amplitude are relatively rare.

Analysis of the data on the storms leads to the conclusion that storms lasting from 20 to 40 hours are most frequent, and if storms are grouped by values of the amplitudes, the storms most frequently occurring in Leningrad have horizontal component amplitudes from 150 to 200 gammas. In Sverdlovsk storms having horizontal-component amplitudes from 100 to 150 gammas are most frequent. Finally, the results in Tashkent are as follows: the most frequent are storms with horizontal-component amplitudes from 100 to 130 gammas.

27-Day Recurrence of Magnetic Storms

The physical fundamentals, explaining the tendency of magnetic storms to recur approximately every 27 days, were already discussed briefly above. Inasmuch as this tendency can be used for several practical purposes (prediction of magnetic storms), the problem of the 27-day recurrence of magnetic storms is the subject of a relatively extensive literature. Materials of observation of the magnetic observatory in Leningrad during 1878-1940 were used earlier in the stay of the 27-day recurrence of magnetic storms (6). The same article lists also the bibliography on the subject.

To examine the problem of the 27-day recurrence of magnetic storms, the data from the summary catalogue are represented in Figure 89 in the form of a diagram, in which each day is represented by a square. The squares are arranged in rows of 27 each. Each square in the lower line corresponds to a day that is 27 days removed from the days corresponding to the squares of the upper line. Various arbitrary symbols indicate whether these days contain storms, and if so whether the storm was moderate, intense, or very intense. Following any vertical column in the diagram, it is possible to trace which days were 27 days apart from others. The 6 left columns are repeated to the right of the 27 columns to facilitate review of the character of the recurrence of the storms. Examination of the diagram convinces one that in 1936-1948 many groups (sequences) of storms were observed, formed by several storms that are 26 to 28 days apart. It is seen from the diagram that in these years there occurred many recurrences of the storms (if by recurrence we mean the appearance of a storm 26 to 28 days after a preceding storm). These recurrences can apparently be attributed to a prolonged existence of streams of solar particles. A general impression resulting from examination of the diagrams is also the conclusion that the recurrence was particularly steady during years of low activity (in 1943-1944 one storm recurred 17 times!) and the recurrence is least steady in years of increasing activity (1946-1948). The former conclusion does not fully agree with deductions obtained above (6) from data of the Leningrad magnetic observatory, for these data indicated that the recurrence is lowest during years of minimum activity.

Of great significance is the problem of what category of storms, moderate, intense or very intense, have a higher tendency towards recurrence? Prior to the work described in reference 6, the consensus of the literature was that the stronger the storm, the less reason for expecting it to recur in the form of a storm of any intensity. This conclusion was changed somewhat in reference (6), where it was established that the stronger storms recur in the form of storms of any intensity more frequently than even moderate storms, which have a greater tendency to recur than intense and very intense storms.

The materials of the summary catalogue permit reexamination of this problem. For this purpose the data contained in the catalogue and in the diagram (Figure 89) were used to plot Figure 90, in which the horizontal scale indicates the days from 0 to 110, starting with the day of a moderate (upper third of the drawing), intense (middle third) and very intense (lower third of the drawing) storm, and where the vertical scale shows for each of the days from 0 to 110 the number of days belonging to a storm of any category. Thus this drawing answers the following question: in what number of cases is a day, separated by n days from a day belonging to any of the storms of any category, also a day of recurrence of any other storm, regardless of what category? It can be seen from the Figure that in fact the moderate storms recur every 1 to 3 rotations of the sun more frequently than intense storms, while intense storms recur more frequently than very intense storms. For example, it can be said that approximately in 40 out of 100% there will be a new storm following 27 days after a day of a moderate storm. The percentage can be read approximately from the drawing for any day for which data are available. Thus, the material of the summary catalogue confirms the long-known conclusion that with increasing intensity the storm has a decreasing tendency to recur.

Of extreme interest in Figure 90 are the secondary maxima, occurring at 13 to 15, 37, 65, and 90 days, which are very pronounced on the curve showing the recurrence of moderate storms, and which are less pronounced but still noticeable on the remaining curves. The presence of such secondary maxima was noted in reference (6) but the author did not risk insisting on their being real. Now, having received confirmation of the existence of such secondary maxima, they can not be considered as accidental and must be explained in some manner.

The explanation is best found after considering the following question: what specific kind of storm, moderate, intense or very intense, caused the individual maxima on the curves of Figure 90? To answer this question we present Figure 91 and the corresponding Table 108. Much more can be seen from this figure and from the table than from Figure 90. In particular, it is seen that within 27, 54, and 81 days moderate storms recur more frequently as moderate storms. At the same time it can be seen that the maxima at 13, 65, and 90 days are also caused by moderate storms. It is also seen from Figure 91 that, for example, intense storms also recur every 27 days in most cases in the form of intense storms, while the same storms recur on the 54th day in moderate form. It is seen in addition that actually only an insignificant number of very intense storms recur in 27, etc days, but when they do recur, it is also in the form of very intense storms. Let us note that this conclusion corresponds to the deduction of reference (6) that the strongest storms have a higher tendency to recur.

As to the recurrence of storms on the thirteenth and other intermediate days that are not multiples of 27, these recurrences can be explained within the framework of a hypothesis by a Soviet geophysicist P. I. Gusev (7) who made the assumption that the corpuscular streams, which propagate in space, fill not the volume of a certain cylinder, but a region adjacent to a plane passing through the bipolar group of sunspots corresponding to the stream and through the center of the sun. With this, the same stream should evidently create 2 magnetic storms, separated by 13 to 14 days, and not a single one, for the storm can occur first of all when the stream catches up with the earth while it is visible to the group of sunspots creating the stream, and in addition also when these spots are invisible from the earth. The variations in the density of the stream and the variation in the distances to the location where it is created may cause the nonsystematic recurrence of the storms in the thirteenth or fourteenth day.

Magnetic Disturbance Days

In certain days, during which the magnetic activity is estimated as being weak, the magnetograms show magnetic disturbances, which are called "bays." They are so called because the curve traced on the magnetogram during these disturbances is similar in middle latitudes to the outline of the bay or cove on a geographic map.

The disturbance days can be noted simultaneously on all the magnetic elements, recorded by the observatory, but sometimes they are greater in some element than in another. Their duration usually ranges from 10 to 20 minutes to 1 to 1 1/2 hours. Characteristic of their shape is the following: the values of the element start deviating gradually to one direction from their normal daily course until these deviations reach a maximum value for the given disturbance. Then, also gradually, the values of the element begin returning to the magnitudes corresponding to the normal daily course (quiet daily variations). The greatest deviation usually occurs in the mid-point of the period during which the disturbance exists.

The bay disturbances can be seen on the magnetograms of the low and middle latitude magnetic observatories.

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At the same time when bay disturbances are observed in middle latitudes, a magnetic storm occurs at higher latitudes. This storm is not accompanied by a universal reduction in the values of the horizontal component, such as is characteristic for world storms. Such storms are called "polar magnetic storms."

The physical explanation for the bay disturbances is as follows: in those cases when no ring of electric current is formed outside the ionosphere around the earth during the time of magnetic storms, the magnetic storm develops principally because solar corpuscules penetrate into the earth atmosphere at high latitudes. Their penetration produces at high latitudes currents that are supplementary to the normal electric currents, and the magnetic field of the supplementary currents is indeed the field of the polar magnetic storm. The strongest current pulses cause the currents to spill over to more southern latitudes. With this, magnetic fields are produced at these more southerly latitudes and manifest themselves in the form of magnetic disturbance bays. One can also remark that during the time of world magnetic storms, i.e., those storms during which the current anolus is produced around the earth, the penetrations of the corpuscules at high latitudes are more frequent than during the time of polar storms. The stronger current pulses follow each other almost continuously, and one can say that the series of disturbance bays that are partly superimposed on each other are observed at all latitudes. In other words, the magnetic disturbance bays represent that elementary magnetic field, a large part of which forms the irregular portion of the field of the world magnetic storms. This is why the study of the magnetic disturbance bays is of definite interest for the understanding of the laws that hold for the field of magnetic storms.

It must be emphasised that in addition to the disturbances of the type described, one frequently encounters disturbances that do not have such irregular form, and the physical nature of which is apparently the same as that of the bays.

The magnetic disturbance bays are usually divided in each element into 2 groups, depending on whether the values of the element increase or decrease as compared with the quiet daily course. Disturbances of the first group are called positive, and those of the second negative.

The laws obeyed by the disturbance bays can be determined by generalizing information concerning their frequency, their distribution with the hour of the day, with the time of the year, and with the years of the 11-year cycles, as well as by determining the laws followed by their amplitudes. The amplitude of a disturbance bay is understood to be the value of the maximum deviation occurring during the time of the disturbance, relative to the quiet daily variations for the corresponding hours.

The information given below is based on the catalogues of the magnetic disturbance bays, compiled for 1938-1948 for the following magnetic observatories: Srednikan, Sverdlovsk, Kazan', Yuzhno-Sakhalinsk, and Tbilisi. The catalogues were compiled by T. N. Panov in Sverdlovsk, N. F. Pushkin in Kazan', N. A. Katziashvili in Tbilisi, and V. I. Afanas'yeva in Srednikan and Yuzhno-Sakhalinsk.

The data on the disturbance bays, selected for each observatory, were compiled in these catalogues on the basis of an examination of the magnetograms of the horizontal component, disregarding the other data.

One must remark above all that the frequency of the disturbance bays at the various observatories is quite different. During the same 9-year period of time from 1938-1946, 216 disturbance bays were noted in Srednikan, 401 in Sverdlovsk, 89 in Kazan', 90 in Yuzhno-Sakhalinsk, and 147 in Tbilisi. Since Sverdlovsk and Kazan' are relatively close to each other, the difference in the number of disturbances noted for these 2 observatories (almost 5 times more in Sverdlovsk) can not be attributed to difference in the geographic location of the observatory and is proof of exceedingly large difference in the approach of various authors to the problem of determination of the disturbance bay. However, the same author noted 216 disturbances in Srednikan and 90 in Yuzhno-Sakhalinsk. Consequently, the frequency of the disturbances does nevertheless exhibit a geographic dependence, mostly on latitude. However, apparently this dependence of the frequency on latitude (reduction in the number of disturbances with southward shift of latitude) is masked to a considerable extent by the noted subjectivism of various authors.

Figures 92 and Table 109 show the relative distribution of the frequency of disturbance bays over the years within the series of years for which data are available. The distribution of the positive and negative disturbance bays are shown separately. The conclusions drawn from this material are as follows: there is no noticeable dependence of the disturbance frequency on the activity level. Figure 93 presents the results of the statistics of the distribution of the disturbance bays over the months of the year again separately for negative and positive disturbances. The corresponding numerical data are collected in Table 110. It can be seen from the drawing and from the table that the number of disturbances occurring in the winter months are noticeably predominant, and that there are hardly any disturbances in the summer months. On the average, disturbances are 2.6 times less frequent in May-August than in the remaining months. Data on the negative disturbances indicate that they have a maximum frequency in February-March and September-October, but the statistical data are scant and this conclusion can not be drawn categorically.

The data of Figure 94 and Table 111 show the distribution of the disturbance bays over the hours of the day. The daily course of the disturbances follows definitely the local rather than the world time. The positive disturbances are most frequent during night hours, and the negative ones in the morning and evening hours. No positive disturbances are observed in the forenoon hours.

It must be noted that within the territory of the USSR there are no large geographic features either in the annual or in the daily distribution of the disturbances.

In conclusion let us give several figures on the averages of the amplitudes of the disturbance bays (the amplitudes were disturbances in that sense as indicated above, i.e., the maximum deviations from the quiet daily course occurring during the time of the disturbance: in the horizontal component we have an amplitude of 47 gammas in Srednikan, 41 gammas in Sverdlovsk, 45 gammas in Kazan', 25 gammas in Yuzhno-Sakhalinsk, and 33 gammas in Tbilisi. During the instants of maximum deviations from the daily course of the horizontal component, the deviations of the vertical component average 2 to 12 gammas, while the deviations in declination are 2 minutes in Tbilisi and Yuzhno-Sakhalinsk, 8 minutes in Kazan', 5 minutes in Sverdlovsk, and 15 minutes in Srednikan.

The literature contains a small number of references concerning disturbance bays. A thorough investigation is that by Silsbee and Vestine (30).

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TABLE 1

LIST OF OBSERVATORIES AND OUTLINE OF DATA EMPLOYED IN THE HANDBOOK

Serial No	Name of observatory	Abbreviation	Geographic Latitude	Geographic Longitude	Geomagnetic latitude	Years, for which data were used for calculations: Annual* variations	Solar-daily variations	Disturbed daily variations	Aperiodic storm-time variations	Catalogue of storms compiled
1	Bukhta Tikhaya	BT	80°20′	52°48′	71.5		1937, 1944	1937, 1944	1938–46	—
2	Mys Chelyuskin	MCh	77 43	104 17	65.9		1944	1944	—	—
3	Dikson	Di	73 30	80 24	63.0		1937, 1944	1937, 1944	1938–43	—
4	Matochkin Shar	MSh	73 16	56 24	64.8		1937, 1944	1937, 1944	—	—
5	Tiksi	Ti	71 40	128 54	63.7		1944, 1947	1944, 1947	—	—
6	Uelen	Ue	66 10	190 10	61.8		1937, 1943	1937, 1943	1938–43	—
7	Srednikan	Sr	62 26	152 19	53.2	1936–38, 1943–46	1918	1948	—	1938–48
8	Yakutsk	Yak	62 01	129 40	51.0	1937–49	1938–48	1938–48	1938–48	—
9	Leningrad (Voyeñkovo vill)	Ln	59 57	30 42	56.0	1930–40	1923–33, 1948	1918	—	1938–40, 1947–48
10	Sverdlovsk (V. Dubrava)	Sv	56 44	61 04	48.5	1937–49	1938–48	1938–48	1938–48	1938–48
11	Kazan' (Zaymishche)	Ka	55 50	48 51	49.3	1937–49	1938–48	1938 - 48	1938–18	—
12	Moscow	Mo	55 28	37 19	52.0	1947–50	1948	1948	—	—
13	Irkutsk (Zuy)	Ir	52 28	104 02	41.0	1937–49	1938–48	1938–48	1938–48	1938–48
14	Yuzhne-Sakhalinsk	Yus	46 58	142 45	36.9	1933–41	—	—	—	1938–48
15	Odessa (Stepanovka)	Od	46 47	30 53	43.8	1936–39, 1948–50	1948	1918	—	—
16	Vladivostok (Voroshilov)	Vl	43 15	132 20	32.4	—	1941, 1944, 1945, 1946, 1947	1941, 1944 - 47	1938 - 48	—
17	Tbilisi (Dusheti)	Tb	42 05	44 42	36.7	1937–49	1938–48	1938–48	1938–48	—
18	Tashkent (Keles)	Tsh	41 25	69 12	32.4	1937–49	1938–48	1938–43	1938–48	1938–48

*Od -- without 1950 data for X, Y, and F. Mo -- without F for 1950. Ln -- Supplementary data for F in 1941.

Sr -- supplementary data for D, H, and Z for 1939 and 1948-1949.

TABLE 2

CYCLIC VARIATION OF HORIZONTAL COMPONENT (H) OF GEOMAGNETIC FIELD AND THEIR DERIVATION USING LENINGRAD MATERIALS FOR 1878-1941

Year	Observed value of u (gammas)	First smoothing $u^{(1)}$	Second smoothing $u^{(2)}$	Secular course $w = 2u^{(1)} - u^{(2)}$	Long-period $v = u - w$
1878	16 364	—	—	—	—
1879	372	—	—	—	—
1880	369	—	—	—	
1881	373	—	—	—	—
1882	371	—	—	—	
1883	380	16 381.3	—	—	—
1884	387	385.2	—	—	—
1885	391	389.4	—	—	—
1886	392	394.2		—	—
1887	397	398.8	—	—	—
1888	398	405.6	16 410.2	16 401	−3
1889	407	412.5	417.8	407	0
1890	418	420.8	426.3	415	3
1891	422	430.3	435.5	425	−3
1892	424	441.4	445.4	437	−13
1893	446	452.7	456.1	449	−3
1894	456	465.3	467.0	464	−8
1895	478	478.1	478.0	478	0
1896	495	490.8	488.6	493	2
1897	514	503.6	498.4	509	5
1898	522	515.9	507.0	529	−3
1899	536	525.5	514.0	537	−1
1900	548	533.2	518.8	548	0
1901	558	537.7	521.2	554	4
1902	563	538.5	520.7	556	7
1903	593	535.8	516.9	555	4
1904	552	529.3	509.5	549	3
1905	540	518.7	498.4	539	1
1906	528	504.0	483.5	524	4
1907	503	485.2	464.7	506	−3
1908	485	462.0	442.2	482	3
1909	450	434.8	416.1	454	−4
1910	420	403.7	386.7	421	−1
1911	386	369.0	354.2	384	2
1912	351	331.0	319.1	343	8
1913	308	291.0	281.5	300	8
1914	260	248.6	242.1	255	5
1915	210	205.7	201.0	210	0
1916	158	161.7	158.7	165	−7
1917	110	117.1	115.5	119	−9
1918	063	072.3	071.9	073	−10
1919	16 019	16 027.7	16 027.9	16 028	−9
1920	15 978	15 983.8	15 983.8	15 983	−5
1921	936	938.2	939.7	937	−1
1922	895	894.3	895.7	893	2
1923	858	850.6	852.0	849	9
1924	818	807.3	808.6	806	12
1925	770	763.6	765.5	762	8
1926	715	720.7	722.9	718	−3
1927	675	678.0	681.0	675	0
1928	630	636.0	639.9	632	−2
1929	586	594.8	599.6	590	−4
1930	539	554.1	560.5	548	−9
1931	506	514.6	522.7	506	0
1932	466	477.5	—	—	
1933	433	441.5	—	—	—
1934	405	407.9	—	—	—
1935	370	376.5	—	—	—
1936	336	348.4	—	—	—
1937	306	—	—	—	—
1938	280	—	—	—	—
1939	260	—	—	—	—
1940	240	—	—	—	—
1941	230	—	—	—	—

TABLE 3

CYCLIC VARIATIONS OF HORIZONTAL COMPONENT (H) (IN GAMMAS)

Year	Leningrad	Sverdlovsk	Irkutsk	Kazan'	Tbilisi	Kazan' (smoothed values)	Year	Leningrad	Sverdlovsk	Irkutsk	Kazan'	Tbilisi	Kazan' (smoothed values)
1878	6						1910	-1	3	-7	21		14
1879	6						1911	2	2	-5	11		18
1880	-2						1912	8	7	6	28		21
1881	-1						1913	8	7	18	17		16
1882	-10						1914	5	4	6	2		4
1883	-3						1915	0	-5	-4	-4		-4
1884	2						1916	-7	-9	-14	-12		-9
1885	3	-2					1917	-9	-12	-14	-8		-8
1886	0	-2					1918	-10	-9	-7	-6		-8
1887	3	1			-11		1919	-9	-8	5	-14		-8
1888	-3	2			-16		1920	-5	-2	10	3		-4
1889	0	3			0		1921	-1	4	10	-8		-6
1890	3	5			12		1922	2	5	6	-12		-5
1891	-3	-3			14		1923	9	12	-6	13		6
1892	-13	-16			-5		1924	12	12	-2	10		12
1893	-3	-6			-3		1925	8	7	0	13		9
1894	-8	-7			-6		1926	-3	-7	0	-1	-11	5
1895	0	2	-1		4		1927	0	-6	1	10	-2	5
1896	2	7	6		6		1928	-2	-7	-2	0	-2	0
1897	5	9	3		15		1929	-4	-7	-10	-9	0	-7
1898	-3	1	3		15		1930	-9	-13	-19	-9	-10	
1899	-1	-1	-2		0		1931	0	1	2	-4	1	
1900	0	0	7		-2		1932	-3	0	6	-9	-4	
1901	4	0	10		-9		1933	2	6	11	-3	0	
1902	7	0	9		-19		1934	8	10	18	10	3	
1903	4	-5	2		-30		1935	4	8	8	2	2	
1904	3	2	0		11		1936	-4	-2	-2	-3	0	
1905	1	1	0		17		1937	-8	-7	-14	-2	1	
1906	4	7	4		24		1938	-9	-11	-18	0	-6	
1907	-3	4	-1		20		1939	-5	-7	-17	1	0	
1908	3	5	-4		-4		1940	-1	-5	-2	-2	-2	
1909	-4	1	-7	3	0								

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TABLE 4

CYCLIC VARIATIONS OF INCLINATION (I) (MINUTES)

Year	Leningrad	Sverdlovsk	Irkutsk	Kazan'	Tbilisi	Kazan' (smoothed values)	Year	Leningrad	Sverdlovsk	Irkutsk	Kazan'	Tbilisi	Kazan' (smoothed values)
1845		-1.3					1893	0.2	0.7				
1846		1.8					1894	0.6	1.2				
1847		2.2					1895	0.2	0.4	0.7			
1848		-1.5					1896	0.2	0.0	0.7			
1849		0.0					1897	-0.2	-0.4	-0.2			
1850		2.0					1898	0.4	-0.6	-0.2			
1851		0.0					1899	0.5	-0.3	-0.5			
1852		-1.2					1900	0.0	0.4	-0.9			
1853		-1.1					1901	-0.4	0.3	-0.2			
1854		-0.6					1902	-0.7	0.3	-0.8			
1855		0.2					1903	-0.5	0.5	0.1			
1856		1.6					1904	-0.3	0.2	0.1			
1857		-0.6					1905	0.0	-1.9	0.0			
1858		0.5					1906	0.0	-0.5	-0.3			
1859		0.5					1907	0.2	0.0	0.7			
1860		0.4					1908	0.0	0.1	0.7			
1861		0.0					1909	0.2	0.1	0.7	0.3		
1862		-0.1					1910	-0.1	0.0	0.3	-0.5		0.3
1863		-2.3					1911	-0.2	-0.2	0.0	1.8		0.5
1864		0.4					1912	-0.5	-0.5	-1.1	0.3		-0.3
1865		1.5					1913	-0.6	-0.3	-2.0	-2.7		-1.4
1866		1.4					1914	-0.4	-0.3	-0.1	-2.5		-1.3
1867		0.5					1915	0.0	0.5	1.0	1.1		-0.2
1868		0.3					1916	0.4	0.7	1.5	0.5		0.6
1869		-0.5					1917	0.5	0.6	1.2	0.4		1.2
1870		-0.5					1918	0.7	0.2	0.4	3.3		1.3
1871		-1.3					1919	0.5	0.4	-0.3	0.5		0.5
1872		-1.6					1920	0.5	0.2	-1.0	-2.4		-0.2
1873		-1.4					1921	0.1	-0.3	-0.9	1.2		-0.1
1874		-0.3					1922	-0.1	-0.3	-0.5	0.5		-0.2
1875		-0.3					1923	-0.8	-0.8	0.3	-2.1		-0.8
1876		2.5					1924	-0.9	-1.0	0.2	-0.5		-0.9
1877		2.0					1925	-0.7	-0.6	0.2	-1.0		-0.6
1878	0.3	0.7					1926	0.3	0.7	-0.1	0.2	0.1	0.1
1879	0.3	-0.8					1927	0.1	0.3	-0.3	0.9	-0.2	0.7
1880	0.6	-2.0					1928	0.4	1.0	-0.1	0.7	-0.1	0.8
1881	0.0	-0.5					1929	0.5	0.7	0.4	1.1	0.3	1.0
1882	0.4	0.4					1930	0.7	0.9	1.3	1.2	1.4	
1883	-0.3	0.8					1931	-0.3	-0.1	0.8	-0.8	0.4	
1884	-0.7	1.0					1932	0.0	-0.1	0.0	-0.4	0.6	
1885	-0.2	1.5					1933	-0.4	-0.6	-1.0	-0.6	0.2	
1886	1.0	—					1934	-0.7	-0.8	-1.6	-0.3	0.0	
1887	0.3	-1.9					1935	-0.2	-0.9	-0.9	-1.0	-0.8	
1888	0.5	-0.7					1936	0.5	0.0	0.1	0.2	-0.5	
1889	-0.5	-1.1					1937	0.8	0.5	1.0	0.4	-1.1	
1890	-1.1	-1.3					1938	0.8	0.7	1.4	0.7	0.7	
1891	-0.3	-0.2					1939	0.4	0.4	1.1	0.4	-0.1	
1892	0.9	1.3					1940	0.0	0.3	0.2	0.7	0.1	

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TABLE 5

CYCLIC VARIATIONS OF DECLINATION (D) (MINUTES)

Year	Leningrad	Sverdlevsk	Irkutsk	Kazan'	Tbilisi	Year	Leningrad	Sverdlevsk	Irkutsk	Kazan'	Tbilisi
1878	0.7	−3.5				1910	0.0	0.5	1.8	−8.8	0.4
1879	0.4	−4.4				1911	0.3	0.4	1.0	−6.9	−0.7
1880	0.4	−1.6				1912	0.1	−0.3	−1.3	−2.9	−0.9
1881	0.2	1.3				1913	0.4	−0.2	−0.9	−2.6	−0.3
1882	0.3	4.5				1914	0.8	0.3	−0.5	4.6	0.2
1883	0.2	1.1				1915	0.9	1.4	−0.2	3.9	2.0
1884	0.5	2.5				1916	1.0	1.7	−0.7	3.5	2.1
1885	0.6	0.7				1917	0.3	1.0	−0.7	1.8	1.0
1886	0.6	0.9				1918	−0.3	0.2	−1.0	−0.4	—
1887	0.3	−2.7			0.0	1919	−0.5	−0.4	−0.5	0.2	—
1888	−0.3	−2.1			0.0	1920	−0.9	−1.3	−1.1	−1.1	−0.8
1889	−1,3	−2.1			−1.0	1921	−1.1	−1.4	−0.9	−1.6	−1.4
1890	−1.8	−1.8			−1.1	1922	−1.0	−0.8	−1.1	−1.6	−0.9
1891	−1.4	−0.7			−0.5	1923	−1.1	−0.9	−0.7	−0.8	−0.4
1892	−0.6	1.2			0.1	1924	−0.5	−0.1	1.1	0.2	−1.8
1893	−0.3	0.6			0.3	1925	0.3	0.8	2.2	0.7	1.1
1894	0.8	1.2			0.1	1926	1.7	1.6	3.9	3.3	1.9
1895	1.0	0.9	0.5		−0.4	1927	1.6	1.0	4.0	0.9	1.6
1896	1.5	0.6	−0.4		−0.2	1928	1.4	0.8	0.2	1.6	1.9
1897	1.0	−0.2	−0.3		−0.5	1929	1.0	0.2	−5.1	−0.4	0.2
1898	1.1	−0.1	−0.3		0.4	1930	0.5	0.1	−3.3	−0.4	−0.1
1899	0.2	−0.6	−0.5		0.4	1931	−1.2	−1.2	−1.5	−1.6	−0.6
1900	−0.5	−0.6	−0.7		0.5	1932	−1.1	−1.2	0.1	−0.9	−0.1
1901	−0.3	−0.3	0.0		0.1	1933	−0.9	−1.1	1.7	−0.8	0.2
1902	−0.3	0.1	−0.6		0.8	1934	−1.1	−1.2	1.8	−0.5	0.5
1903	0.2	0.6	−0.3		1.1	1935	0.1	−0.6	1.0	−0.4	−0.6
1904	0.2	0.4	−0.6		0.5	1936	0.8	0.3	0.4	0.0	−1.9
1905	0.0	0.0	−0.6		0.0	1937	0.4	1.2	0.3	0.1	−2.1
1906	−1.0	−0.8	−0.3		−0.9	1938	0.5	1.5	−0.1	1.5	1.0
1907	−1.0	−0.7	1.2		−1.0	1939	0.2	1.2	−0.2	1.3	−0.1
1908	−1.3	−0.6	2.8		−1.2	1940	0.4	0.9	−0.6	0.7	0.0
1909	−0.3	0.5	2.1	−6.6	0.3						

TABLE 6

CYCLIC VARIATIONS OF VERTICAL COMPONENT (Z) GAMMAS)

Year	Leningrad	Sverdlovsk	Irkutsk	Kazan'	Tbilisi	Year	Leningrad	Sverdlovsk	Irkutsk	Kazan'	Tbilisi
1886	45					1895	9		32		−11
1887	21				4	1896	12	21	52		−1
1888	18				−13	1897	6	8	−4		−2
1889	−24				−19	1898	11	−20	−6		17
1890	−39				−2	1899	17	−17	−33		21
1891	−20				32	1900	−2	6	19		9
1892	0				21	1901	−10	0	15		−11
1893	1				6	1902	−14	4	−20		−27
1894	7				2	1903	−9	0	14		−39
1904	−6	6	6		−45	1923	−9	−3	−3	−59	
1905	8	3	0			1924	−8	−12	1	11	
1906	14	−14	0			1925	−5	−12	5	−17	
1907	4	0	36			1926	5	14	−4	−3	−11
1908	−5	9	24			1927	6	−3	−11	71	−89
1909	1	−2	10	39		1928	9	24	−11	35	−3
1910	−7	−6	−6	47		1929	14	13	−10	20	15
1911	−1	−5	−18	111		1930	3	2	15	33	29
1912	1	1	−42	92		1931	−17	0	19	−43	29
1913	−3	6	−55	−72		1932	−9	−5	15	−52	30
1914	−5	2	12	105		1933	−10	−15	−22	−33	10
1915	−2	8	41	35		1934	−9	9	−36	8	7
1916	−6	5	40	−7		1935	−2	−14	−26	32	−16
1917	−2	−7	19	−6		1936	9	−8	3	0	−44
1918	1	−18	7	122		1937	14	0	13	16	−35
1919	8	−2	4	−21		1938	5	2	18	29	10
1920	7	2	−22	−87		1939	3	−1	12	21	−7
1921	1	1	−20	34		1940	−4	5	6	22	17
1922	−2	3	−11	−9							

TABLE 7

CYCLIC VARIATIONS OF HORIZONTAL COMPONENTS AND INCLINATION (H AND I)

(WEIGHTED AVERAGES)

Year	ΔH (gammas)	ΔI (minutes)	Year	ΔH (gammas)	ΔI (minutes)
1878	6	0.3	1910	2	0.0
1879	6	0.3	1911	3	−0.1
1880	−2	0.6	1912	8	−0.5
1881	−1	0.0	1913	8	−0.5
1882	−10	0.4	1914	5	0.4
1883	−3	−0.3	1915	−3	0.3
1884	2	−0.7	1916	−9	0.6
1885	0	−0.2	1917	−11	0.7
1886	−1	1.0	1918	−9	0.5
1887	2	0.2	1919	−6	0.4
1888	0	0.7	1920	−1	0.2
1889	2	−0.2	1921	3	[illegible]
1890	4	−0.8	1922	3	−[illegible]
1891	−3	0.0	1923	9	[illegible]
1892	−14	1.1	1924	9	−0.8
1893	−4	0.4	1925	6	−0.6
1894	−8	0.9	1926	−3	0.4
1895	1	0.3	1927	−2	0.2
1896	5	0.2	1928	−4	0.6
1897	7	−0.3	1929	6	0.6
1898	−1	−0.1	1930	−12	0.9
1899	−1	0.0	1931	0	−0.2
1900	1	0.1	1932	−1	−0.1
1901	3	−0.1	1933	5	−0.6
1902	4	−0.3	1934	11	−0.8
1903	0	0.0	1935	6	−0.6
1904	2	0.0	1936	−3	0.2
1905	1	0.0	1937	8	0.7
1906	5	0.0	1938	−11	0.8
1907	0	0.2	1939	−8	0.5
1908	3	0.1	1940	−3	0.2
1909	2	0.2			

TABLE 8

AVERAGED CYCLICAL VARIATION

Year of solar cycle	ΔH (gammas)	ΔI (minutes)	Relative number of sunspots
1	7	−0.6	6
2	4	−0.4	21
3	−1	0.1	48
4	−4	0.4	69
5	−5	0.5	74
6	−3	0.4	75
7	−2	0.3	62
8	−2	0.3	40
9	0	0.0	29
10	1	−0.1	15
11	3	−0.2	8

TABLE 9

LONG-PERIOD VARIATIONS

	1	2	3	4	5	6	7	8	9	10	11
Yakutsk											
Declination D (in minutes)											
1938–1939	−0.4	−0.2	−0.2	0.0	0.1	0.3	0.4	0.6	0.6	0.2	0.1
1940–1941	−0.1	−0.2	−0.2	0.2	−0.3	−0.4	−0.5	−0.4	−0.4	−0.4	−0.4
1942–1943	0.0	−0.2	0.0	−0.1	−0.1	0.0	0.2	0.4	0.2	0.0	−0.1
1944–1945	0.5	0.6	0.7	0.9	0.7	0.6	0.6	0.5	0.3	0.3	0.0
1946–1947	0.1	−0.3	−0.5	−0.6	−0.2	−0.1	−0.2	0.0	0.1	0.1	0.2
1948	−0.2	−0.2	0.0	0.1	0.2	0.0	−0.2	0.0	0.0	0.0	0.2
Horizontal component H (in gammas)											
1938–1939	−5	−6	−4	−3	−4	−2	−1	1	1	0	2
1940–1941	−2	−2	−2	0	1	1	1	2	1	1	3
1942–1943	0	0	1	2	2	3	2	3	3	3	3
1944–1945	0	2	3	4	6	6	4	4	3	2	2
1946–1947	−2	−2	−2	−3	−4	−6	−1	−1	−3	−2	0
1948	1	1	0	3	2	2	2	−1	−2	−2	−4
Northern component X (gammas)											
1938–1939	−5	−5	−5	−5	−3	−3	−1	1	2	2	2
1940–1941	−2	−2	−2	−2	−1	−1	0	1	2	2	2
1942–1943	−1	1	0	1	2	2	4	4	3	3	2
1944–1945	1	2	4	5	6	6	4	5	4	2	1
1946–1947	−2	−2	−3	−4	−4	5	−5	−4	−4	−2	0
1948	1	2	2	3	2	2	1	0	−1	−2	3
Eastern component Y (gammas)											
1938–1939	−1	1	1	2	2	2	2	2	2	1	0
1940–1941	0	0	0	−2	0	−2	−3	−2	−1	−2	−3
1942–1943	0	−1	1	0	0	−1	0	0	0	0	−1
1944–1945	2	3	3	2	2	1	0	0	0	0	0
1946–1947	1	0	0	1	1	0	0	2	0	1	1
1948	−2	−1	−1	−1	0	0	−1	1	0	0	2
Sverdlovsk											
Declination D (minutes)											
1938–1939	0.2	0.2	0.2	0.2	0.2	0.2	−0.1	−0.2	−0.4	−0.2	−0.2
1940–1941	0.1	0.0	−0.2	−0.1	−0.2	−0.1	−0.2	−0.2	−0.2	−0.3	−0.2
1942–1943	0.1	−0.1	−0.2	−0.2	−0.3	−0.3	−0.3	−0.2	−0.3	−0.2	−0.3
1944–1945	−0.1	−0.1	−0.3	−0.3	−0.5	−0.5	−0.3	−0.3	−0.3	−0.2	−0.2
1946–1947	0.2	0.2	0.3	0.3	0.3	0.3	0.4	0.4	0.4	0.1	0.0
1948	−0.1	−0.1	0.0	−0.2	−0.1	−0.1	−0.1	0.0	0.0	0.1	0.2
Horizontal component H (gammas)											
1938–1939	−2	−4	−4	−2	−2	−2	0	2	2	2	1
1940–1941	1	0	0	2	0	0	0	0	0	2	2
1942–1943	0	0	2	2	3	2	4	2	4	2	3
1944–1945	−3	−2	0	2	1	2	2	2	2	1	1
1946–1947	−2	−3	−2	−3	−5	−5	−5	−4	−4	−1	0
1948	0	1	1	0	2	0	1	0	−2	−3	2

Yakutsk

Declination D (in minutes)

	12	13	14	15	16	17	18	19	20	21	22	23	24
1938-1939	-0.1	0.0	-0.1	0.1	0.2	0.5	0.7	0.7	0.5	0.2	0.2	0.1	-0.1
1940-1941	0.0	0.2	0.4	0.2	0.2	0.2	-0.1	-0.4	-0.4	-0.4	-0.3	0.0	0.1
1942-1943	-0.2	-0.4	-0.5	-0.5	-0.6	-0.5	-0.3	-0.3	-0.3	-0.1	0.0	0.1	0.2
1944-1945	0.0	-0.1	-0.2	-0.2	0.0	0.3	0.2	0.4	0.5	0.5	0.4	0.3	0.2
1946-1947	0.2	0.3	0.2	0.4	0.2	0.0	0.0	-0.2	-0.3	-0.4	-0.4	-0.3	-0.1
1948	0.2												

Horizontal component H (in gammas)

	12	13	14	15	16	17	18	19	20	21	22	23	24
1938-1939	2	2	2	2	2	3	1	1	0	0	-1	-2	0
1940-1941	3	3	2	0	0	-2	-2	-2	-3	-2	0	-2	0
1942-1943	2	0	0	0	-3	-3	-3	-2	-3	-3	-3	-2	-1
1944-1945	0	0	0	0	1	1	2	3	3	2	2	0	0
1946-1947	0	0	2	1	0	-1	-2	-2	2	-1	2	2	1
1948	-4												

Northern component X (gammas)

	12	13	14	15	16	17	18	19	20	21	22	23	24
1938-1939	1	2	2	2	2	3	2	1	0	0	0	-1	1
1940-1941	4	3	2	0	0	-1	-2	-3	-3	-2	-2	-1	1
1942-1943	2	1	0	-1	-3	-3	-2	-3	-2	-2	-2	-2	0
1944-1945	1	0	0	1	0	1	2	4	4	2	1	1	-2
1946-1947	0	2	2	1	0	-1	-2	-2	-2	-1	0	1	1
1948													

Eastern component Y (gammas)

	12	13	14	15	16	17	18	19	20	21	22	23	24
1938-1939	0	-1	-1	1	0	0	3	2	3	2	1	1	0
1940-1941	-1	0	2	2	1	1	1	-1	-1	-1	0	0	0
1942-1943	-3	-3	-2	-2	-2	-1	0	0	0	0	2	2	2
1944-1945	-1	-1	-1	-1	-1	-1	0	0	1	2	1	2	2
1946-1947	0	2	0	2	0	0	0	0	0	0	-2	-1	-2
1948	2												

Sverdlovsk

Declination D (minutes)

	12	13	14	15	16	17	18	19	20	21	22	23	24
1938-1939	-0.2	-0.1	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.1	0.2	0.1	0.1
1940-1941	-0.3	-0.1	-0.1	0.2	0.2	0.3	0.3	0.4	0.4	0.2	0.2	0.2	0.0
1942-1943	-0.2	-0.2	-0.2	-0.1	0.0	0.0	0.0	0.2	0.1	0.1	0.2	0.2	0.2
1944-1945	-0.2	-0.1	-0.2	-0.2	-0.3	-0.3	-0.4	-0.5	-0.5	-0.5	-0.4	-0.1	0.0
1946-1947	-0.2	-0.2	-0.3	-0.1	0.0	0.1	0.2	0.2	0.2	0.0	-0.1	-0.1	-0.1
1948	0.2												

Horizontal component H (gammas)

	12	13	14	15	16	17	18	19	20	21	22	23	24
1938-1939	1	0	-1	0	0	-1	1	0	0	-1	-2	-2	-1
1940-1941	3	2	2	-1	-1	-3	-3	-4	-4	-4	-2	-3	-2
1942-1943	1	1	1	0	-1	0	-1	-2	-1	-3	-2	-4	-2
1944-1945	1	0	2	2	2	3	4	4	4	2	3	0	0
1946-1947	0	2	2	1	0	-1	-2	-2	-2	-1	0	1	0
1948	-2												

	1	2	3	4	5	6	7	8	9	10	11
Inclination I (minutes)											
1938—1939	0.3	0.3	0.2	0.2	0.2	0.1	0.0	—0.1	—0.3	—0.2	—0.1
1940—1941	0.1	0.0	0.0	—0.1	—0.1	0.0	0.0	—0.1	—0.1	—0.1	—0.1
1942—1943	0.2	0.0	—0.1	—0.1	—0.2	—0.2	—0.2	—0.2	—0.2	—0.2	—0.2
1944—1945	0.1	0.2	0.0	0.0	—0.2	—0.2	—0.2	—0.2	—0.1	0.0	—0.1
1946—1947	0.1	0.1	0.3	0.3	0.4	0.4	0.4	0.4	0.3	0.2	0.1
1948	—0.1	0.0	0.0	—0.1	0.0	—0.1	0.0	0.1	0.0	0.2	0.1
Northern component X (gammas)											
1938—1939	—2	—4	—4	—3	—2	—2	0	2	3	3	2
1940—1941	—1	0	0	0	1	0	0	0	1	2	2
1942—1943	—2	1	1	2	2	4	3	3	3	3	3
1944—1945	—2	—2	0	1	2	3	2	2	1	2	2
1946—1947	—2	—2	—4	—4	—5	—5	—5	—5	—3	—2	1
1948	0	0	1	0	2	1	0	0	—2	—3	—2

Sverdlovsk

	1	2	3	4	5	6	7	8	9	10	11
Eastern component Y (gammas)											
1938—1939	0	0	0	0	0	0	—1	—1	—1	—1	1
1940—1941	0	0	—1	—1	—1	0	0	0	0	—1	0
1942—1943	0	0	0	0	0	0	—1	—1	0	—1	—1
1944—1945	—1	—1	0	—2	—2	—1	—2	—1	—2	—2	0
1946—1947	0	—1	1	0	0	2	0	0	0	0	0
1948	0	0	0	0	—1	—1	0	0	0	1	0
Vertical component Z (gammas)											
1938—1939	4	4	3	2	1	0	—2	—3	3	—3	—1
1940—1941	—2	—2	—2	—2	—2	—2	—2	—2	—2	0	0
1942—1943	2	0	1	1	0	2	0	2	0	0	—2
1944—1945	4	1	0	—2	—3	—4	—5	—3	—1	—1	1
1946—1947	—2	—1	0	4	4	6	6	6	6	4	1
1948	—1	—1	—1	0	—1	—1	0	0	1	1	1
Total Intensity F (gammas)											
1938—1939	3	2	3	0	0	—1	—2	—2	—3	—3	—2
1940—1941	—2	—1	2	—2	—2	—2	—2	—2	0	0	1
1942—1943	—16	—16	—17	—16	—15	—16	—15	—6	2	1	0
1944—1945	3	2	0	—2	—3	4	—3	—3	0	0	0
1946—1947	—3	—2	0	2	4	3	1	4	4	4	1
1948	0	0	—2	—2	—3	—3	—3	—3	3	—3	—3

Kazan'

	1	2	3	4	5	6	7	8	9	10	11
Declination D (minutes)											
1938—1939	0.2	0.2	0.3	0.4	0.5	0.5	0.3	0.1	0.0	—0.1	—0.1
1940—1941	0.3	0.0	0.0	—0.2	—0.2	—0.3	—0.3	—0.5	—0.4	—0.4	0.4
1942—1943	0.1	0.1	0.0	0.0	—0.1	—0.1	—0.2	0.1	—0.2	0.2	0.3
1944—1945	0.1	0.0	—0.2	—0.3	—0.3	—0.4	—0.4	—0.5	—0.4	—0.3	0.1
1946—1947	0.3	0.3	0.4	0.5	0.5	0.5	0.4	0.3	0.2	0.0	—0.1
1948	—0.1	—0.2	—0.2	—0.2	—0.1	—0.2	—0.1	—0.1	0.2	0.2	0.4

Inclination I (minutes)

	12	13	14	15	16	17	18	19	20	21	22	23	24
1938-1939	−0.1	−0.1	0.1	0.1	0.1	0.1	0.0	−0.1	0.0	0.1	0.2	0.1	0.1
1940-1941	−0.2	−0.2	0.0	0.1	0.1	0.3	0.3	0.3	0.4	0.3	0.3	0.2	0.1
1942-1943	−0.1	−0.1	0.0	0.0	0.1	0.1	0.1	0.1	0.2	0.3	0.2	0.2	0.2
1944-1945	−0.1	0.0	0.0	−0.1	−0.1	−0.3	−0.3	−0.3	−0.3	−0.2	−0.3	−0.1	−0.1
1946-1947	0.0	−0.1	−0.1	−0.1	0.0	0.1	0.2	0.1	0.1	0.2	0.0	0.0	0.0
1948	0.0												

Northern component X (gammas)

	12	13	14	15	16	17	18	19	20	21	22	23	24
1938-1939	1	1	−1	0	0	0	−1	−1	−2	−2	−2	−2	−2
1940-1941	3	2	2	−1	−2	−4	−4	−5	−4	−4	−4	−2	−3
1942-1943	1	2	2	0	−1	−1	−1	−2	−2	−2	−4	−2	−3
1944-1945	0	1	2	2	3	4	2	3	4	2	3	2	0
1946-1947	1	2	2	2	0	−1	−2	−1	−1	−1	0	1	1
1948	−2												

Sverdlovsk

Eastern component Y (gammas)

	12	13	14	15	16	17	18	19	20	21	22	23	24
1938-1939	−1	−1	−1	−1	−1	−1	0	0	0	0	0	0	0
1940-1941	0	0	0	0	0	1	1	1	1	0	0	1	0
1942-1943	0	0	−1	0	0	0	0	0	0	1	0	0	0
1944-1945	−1	0	0	0	0	0	0	−1	−2	−1	0	−1	0
1946-1947	0	−1	0	−1	−1	0	0	1	1	0	0	0	0
1948	0												

Vertical component Z (gammas)

	12	13	14	15	16	17	18	19	20	21	22	23	24
1938-1939	−2	0	0	2	0	0	−1	−1	0	0	−2	−2	−2
1940-1941	1	1	2	2	6	3	3	3	4	3	3	2	0
1942-1943	0	−2	−1	0	0	2	4	1	2	2	2	3	4
1944-1945	1	1	2	2	0	−2	−1	−3	−5	−5	5	−4	−4
1946-1947	2	0	0	0	0	0	1	2	2	1	2	0	0
1948	−1												

Total Intensity F (gammas)

	12	13	14	15	16	17	18	19	20	21	22	23	24
1938-1939	−1	0	0	0	0	0	0	0	2	0	0	−2	[illegible]
1940-1941	2	2	2	2	2	2	3	2	2	2	−8	−16	−18
1942-1943	0	0	0	0	0	0	1	1	1	1	1	2	[illegible]
1944-1945	2	2	2	2	0	0	0	−1	−4	−4	−4	−4	[illegible]
1946-1947	3	1	0	0	−1	1	1	1	3	2	2	2	[illegible]
1948	−1												

Kazan'

Declination D (minutes)

	12	13	14	15	16	17	18	19	20	21	22	23	24
1938-1939	−0.1	−0.1	0.0	0.0	0.0	0.0	−0.1	0.1	0.2	0.2	0.3	0.2	0.2
1940-1941	−0.4	−0.4	−0.1	0.1	0.2	0.3	0.5	0.6	0.5	0.4	0.3	0.3	0.3
1942-1943	−0.2	−0.2	−0.2	−0.2	0.1	−0.1	−0.1	0.0	0.0	0.2	0.2	0.2	0.1
1944-1945	−0.2	−0.2	−0.2	−0.2	−0.2	−0.2	−0.2	−0.3	−0.3	−0.1	0.0	0.1	0.1
1946-1947	−0.3	−0.4	−0.4	−0.3	−0.2	−0.2	−0.1	−0.1	0.0	−0.1	−0.2	−0.2	−0.2
1948	0.4												

	1	2	3	4	5	6	7	8	9	10	11
Horizontal component H (gammas)											
1938—1939	—4	—3	—2	—2	—1	0	1	2	3	3	3
1940—1941	—3	—1	—1	—1	—1	—2	—2	1	1	1	3
1942—1943	3	—2	—3	—2	—1	0	1	3	2	4	2
1944—1945	—3	—4	—2	0	2	2	2	1	2	0	1
1916—1947	1	1	0	—1	—2	—1	—2	—3	—2	—2	—1
1948	0	2	2	3	2	2	2	1	0	—2	—2
Inclination I (minutes)											
1938—1939	0.1	0.1	0.2	0.2	0.0	0.1	—0.1	—0.2	—0.1	0.0	0.0
1940—1941	0.0	0.1	0.2	0.1	0.1	0.3	0.2	0.1	0.1	0.0	—0.1
1942—1943	0.1	0.1	0.0	—0.1	—0.2	—0.3	—0.4	—0.4	—0.3	—0.4	—0.3
1944—1945	0.2	0.1	—0.1	—0.1	—0.2	—0.2	—0.2	—0.2	—0.1	0.0	—0.1
1946—1917	0.2	0.3	0.2	0.2	0.2	0.1	0.1	0.0	0.0	0.0	0.0
1948	—0.2	—0.1	—0.2	—0.3	—0.2	—0.2	—0.2	0.0	0.0	0.0	0.0
Northern component X (Gammas)											
1938—1939	—4	—4	—3	—3	—1	—1	0	2	3	3	3
1940—1941	—2	—2	—2	—1	0	1	1	1	2	2	2
1942—1943	—1	—2	—1	—2	—2	0	0	2	2	4	4
1944—1945	—3	—3	—2	0	2	1	2	2	1	2	0
1946—1947	—1	—1	0	1	0	1	1	1	0	1	4
1918	2	3	4	4	3	2	3	1	—1	—2	—3
Eastern component Y (gammas)											
1938—1939	0	0	2	0	2	2	1	1	1	0	0
1940—1941	2	0	0	—1	—1	—2	—2	—2	—2	—2	—1
1942—1943	0	0	—1	—1	0	0	0	—1	0	1	0
1914—1945	—1	—1	—1	—2	—2	—2	—1	—1	—1	—1	—1
1946—1947	1	2	2	2	3	2	2	1	1	0	0
1918	1	0	0	1	4	0	—1	0	1	1	2
Vertical component Z (gammas)											
1938—1939	—4	—2	—1	1	0	2	2	4	5	8	8
1940—1941	—7	—3	1	3	5	6	7	5	4	2	4
1942—1943	2	—4	—7	—10	—12	—13	—12	—11	—8	—6	—4
1914—1945	—2	—6	—6	—6	—6	—4	—3	—2	—2	0	1
1946—1947	3	5	7	9	9	8	8	7	6	3	1
1948	3	1	1	—2	—3	—4	—4	—4	—4	—3	—4
Total intensity F (gammas)											
1938—1939	—4	—3	—2	—1	0	3	5	4	7	7	9
1940—1941	—8	—4	1	2	3	5	6	6	4	4	5
1942—1943	—1	—5	—8	—10	—11	—12	—11	—9	—8	—4	—2
1944—1945	—5	—6	—6	—6	—6	—4	—3	—1	—1	0	1
1946—1917	4	5	7	8	10	9	8	7	6	3	—1
1948	3	3	1	0	—2	—4	—4	—4	—3	—4	—5

Irkutsk

Declination D (minutes)

1938—1939	0.1	0.0	0.0	0.0	—0.1	—0.1	0.0	—0.1	—0.1	—0.2	—0.1
1940—1941	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1942—1943	0.0	—0.1	—0.2	0.0	0.0	—0.2	0.0	—0.2	0.0	—0.2	—0.1
1944—1945	0.0	0.0	0.0	0.0	0.0	0.0	—0.1	0.0	0.0	0.0	0.0
1946—1947	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	—0.1
1948	0.0	—0.1	0.0	—0.1	—0.1	0.0	0.0	0.1	0.0	0.1	0.1

	12	13	14	15	16	17	18	19	20	21	22	23	24
	Horizontal component H (gammas)												
1938-1939	3	2	1	2	2	1	1	0	−1	−2	−3	−3	−3
1940-1941	4	4	4	1	0	−1	−2	−2	−3	−2	−2	−2	−3
1942-1943	3	4	2	2	2	0	0	−2	−2	−4	−5	−4	−5
1944-1945	2	1	0	1	2	2	2	3	3	3	3	2	1
1946-1947	−1	−1	−1	−2	−3	−4	−2	−4	−2	−2	0	−1	0
1948	−3												
	Inclination I (minutes)												
1938-1939	0.1	0.2	0.2	0.0	0.0	−0.1	−0.1	−0.2	0.0	0.1	0.1	−0.1	−0.1
1940-1941	−0.1	−0.1	0.0	0.0	0.0	0.0	0.2	0.3	0.4	0.4	0.2	0.2	0.3
1942-1943	−0.3	−0.2	−0.1	−0.1	0.0	0.1	0.1	0.1	0.3	0.4	0.4	0.4	0.3
1944-1945	−0.1	0.1	0.1	0.0	−0.1	−0.1	−0.1	−0.3	−0.4	−0.2	−0.2	0.0	0.0
1946-1947	0.0	−0.1	0.0	0.0	0.4	0.4	0.3	0.5	0.4	0.4	0.3	0.2	0.0
1948	0.1												
	Northern component X (Gammas)												
1938-1939	2	2	2	1	0	3	3	0	0	−2	−2	−2	−2
1940-1941	2	2	2	0	0	−1	−3	−3	−3	−3	−2	−2	−2
1942-1943	3	3	3	2	1	0	0	−1	−4	−4	−4	−5	−4
1944-1945	2	2	1	1	1	2	3	4	4	2	1	1	0
1946-1947	−1	−1	−1	−4	−5	−6	−6	−6	−7	5	−3	−1	2
1948	−4												
	Eastern component Y (gammas)												
1938-1939	−1	0	0	−1	0	0	0	1	1	1	1	1	2
1940-1941	−2	−1	0	0	1	2	2	2	2	1	0	2	0
1942-1943	0	−1	−2	−1	−1	−1	−2	−1	−1	0	0	−1	0
1944-1945	−1	0	0	1	0	0	−1	−1	−1	−1	1	1	0
1946-1947	−2	−2	−2	−2	−2	−1	−1	−2	−1	−1	−1	0	0
1948	2												
	Vertical component Z (gammas)												
1938-1939	10	9	7	6	4	1	−1	−4	−6	−7	−5	−5	−8
1940-1941	3	3	2	2	2	4	4	6	6	8	8	6	5
1942-1943	−2	2	4	4	6	4	6	6	4	4	2	2	−1
1944-1945	3	3	4	4	2	1	−2	−4	−6	−6	−5	−2	0
1946-1947	−3	−6	−8	−6	−5	−4	0	2	4	3	4	5	5
1948	−5												
	Total intensity F (gammas)												
1938-1939	11	9	8	6	3	1	−2	−4	−4	−7	−8	−9	−9
1940-1941	4	4	4	2	4	3	4	6	6	7	7	7	4
1942-1943	0	3	4	5	5	5	5	4	4	2	2	1	−2
1944-1945	3	3	4	4	2	2	−2	−4	−4	−4	−4	−2	0
1946-1947	−4	−4	−6	−7	−6	4	−2	0	0	2	2	4	4
1948	−6												

Irkutsk

	12	13	14	15	16	17	18	19	20	21	22	23	24
	Declination D (minutes)												
1938-1939	−0.1	−0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	−0.1	0.0	0.0
1940-1941	0.0	0.0	−0.1	−0.1	−0.1	−0.1	−0.1	0.0	−0.1	−0.1	−0.1	−0.2	−0.2
1942-1943	−0.2	0.0	−0.1	−0.2	0.0	−0.1	−0.2	−0.1	−0.1	−0.1	−0.1	−0.1	0.0
1944-1945	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.1	0.1	0.0	0.0
1946-1947	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.2	0.1	0.0	0.1	0.0	0.0
1948	0.0												

	1	2	3	4	5	6	7	8	9	10	11
Horizontal component H (gammas)											
1938—1939	−4	−3	−3	−2	−2	−2	0	2	3	2	2
1940—1941	0	0	2	3	2	0	0	1	−1	−1	0
1942—1943	0	0	2	2	4	4	4	4	5	4	5
1944—1945	−3	−1	1	2	4	5	1	4	4	3	2
1946—1947	−1	−2	−4	−6	−5	−6	−4	−1	−3	−2	2
1948	1	2	2	2	2	2	1	0	−2	−2	−2
Inclination I (minutes)											
1938—1939											
1940—1941	0.1	0.0	0.0	−0.1	−0.2	−0.2	−0.2	−0.2	−0.1	−0.2	0.0
1942—1943	0.0	0.0	0.0	−0.2	0.2	−0.3	0.3	−0.2	−0.2	−0.3	−0.2
1944—1945	0.2	0.0	0.0	−0.2	−0.2	−0.3	−0.2	−0.2	−0.2	−0.2	0.0
1946—1947	0.1	0.1	0.2	0.3	0.3	0.4	0.3	0.3	0.2	0.1	0.0
1948	0.1	0.0	−0.2	0.0	−0.2	−0.2	−0.1	0.0	0.0	0.6	1.3
Northern component X (gammas)											
1938—1939	−3	−3	−3	−2	2	0	2	3	2	2	2
1940—1941	−1	0	1	2	2	1	1	0	0	0	1
1942—1943	−2	1	1	3	3	4	5	5	4	6	4
1944—1945	−4	−2	1	2	1	5	5	4	4	3	2
1946—1947	−1	−2	−4	−6	−5	−6	−4	−4	−3	−2	2
1948	1	2	2	2	2	2	0	0	−1	−3	−2
Eastern component Y (gammas)											
1938—1939	0	0	0	0	−1	0	1	0	0	−1	0
1940—1941	0	0	0	0	0	0	1	0	0	1	0
1942—1943	−1	−1	−1	−1	0	0	1	−1	−1	0	−1
1944—1945	0	0	0	−1	0	0	0	0	0	0	0
1946—1947	0	0	0	0	0	0	0	0	0	0	0
1948	0	−1	0	0	−1	0	0	0	0	1	0
Vertical component Z (gammas)											
1938—1939											
1940—1941	3	2	0	−2	−5	−8	−10	19	−8	−7	−5
1942—1943	−1	−2	−2	3	−3	−2	−2	0	1	1	2
1944—1945	−1	0	−1	2	−2	−2	−1	1	0	0	−2
1946—1947	1	0	2	2	4	5	4	6	4	3	[illegible]
1948	9	9	7	5	4	3	1	0	1	5	6
Total intensity F (gammas)											
1938—1939											
1940—1941	1	6	0	−2	−4	−7	−10	−8	−9	7	−5
1942—1943	−2	−1	−2	−2	−1	−1	0	2	2	2	1
1944—1945	−1	−2	0	−2	0	0	0	1	0	−1	0
1946—1947	−1	−1	1	0	2	2	2	4	3	2	2
1948	7	3	1	0	−2	−1	−2	−1	0	1	0
Tbilisi											
Declination D (minutes)											
1938—1939	0.6	0.5	0.5	0.4	0.3	0.3	0.2	0.1	−0.1	−0.1	−0.2
1940—1941	−0.1	−0.3	−0.4	−0.6	0.5	−0.6	−0.6	0.5	−0.5	−0.3	0.3
1942—1943	0.0	−0.1	−0.2	−0.2	−0.1	0.0	0.0	0.0	0.1	0.1	0.1
1944—1945	0.1	0.1	0.2	0.2	0.0	−0.1	−0.1	0.3	−0.2	−0.1	0.0
1946—1947	−0.3	−0.2	−0.2	−0.2	0.0	0.0	0.2	0.3	0.3	0.4	0.2
1948	−0.2	0.0	−0.2	0.0	−0.2	−0.2	0.0	−0.1	0.0	0.1	0.1

	12	13	14	15	16	17	18	19	20	21	22	23	24
Horizontal component H (gammas)													
1938-1939	0	1	−2	−2	−1	−1	−1	0	0	−2	2	0	−2
1940-1941	2	2	0	0	−2	−3	−4	−4	−6	−4	−4	−2	−3
1942-1943	4	3	2	2	0	−1	−1	−3	−3	−4	−4	−4	−3
1944-1945	1	0	0	2	4	2	4	5	4	4	2	1	0
1946-1947	2	4	3	2	0	0	−2	−2	−3	−1	1	0	1
1948	−2												
Inclination I (minutes)													
1938-1939		0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.1	0.0
1940-1941	−0.2	−0.1	0.0	0.1	0.2	0.4	0.5	0.5	0.4	0.4	0.3	0.2	0.1
1942-1943	−0.2	−0.1	−0.2	0.0	0.0	0.0	0.0	0.2	0.0	0.2	0.2	0.2	0.1
1944-1945	0.0	0.2	0.1	0.0	0.0	−0.1	−0.2	−0.2	−0.2	−0.2	−0.2	0.1	0.1
1946-1947	−0.2	−0.2	−0.2	−0.2	0.0	0.0	0.2	0.2	0.2	0.2	0.0	0.0	0.1
1948	1.3												
Northern component X (gammas)													
1938-1939	1	0	−2	−1	0	0	−1	−2	−1	0	−2	−2	0
1940-1941	2	2	1	−1	−1	−3	−4	−5	−4	−4	−2	−4	−2
1942-1943	4	4	3	0	0	0	−1	−2	−3	−4	−4	−4	−4
1944-1945	1	0	0	2	4	2	4	5	4	4	3	1	0
1946-1947	2	4	3	2	0	0	−2	2	−3	−2	1	0	1
1948	−1												
Eastern component Y (gammas)													
1938-1939	−1	0	0	0	0	0	0	1	0	0	0	−1	0
1940-1941	0	0	−1	1	−1	−1	−1	−1	−1	−1	−1	−1	−1
1942-1943	−1	−1	0	0	0	−1	0	−1	−1	0	−1	0	0
1944-1945	0	0	0	0	0	0	0	0	0	0	0	0	1
1946-1947	0	0	0	0	0	0	1	1	0	0	0	0	0
1948	0												
Vertical component Z (gammas)													
1938-1939		0	−1	−1	−2	−2	2	2	−1	−1	0	1	2
1940-1941	−4	−2	1	5	7	10	13	13	10	8	5	2	−1
1942-1943	2	1	2	2	0	0	−1	2	0	0	−1	−2	0
1944-1945	−1	−1	0	−1	−2	−2	−3	−4	−5	−6	−4	−4	−2
1946-1947	0	−2	−2	−2	0	0	2	2	3	3	3	3	5
1948	6												
Total intensity F (gammas)													
1938-1939		0	−1	−2	−2	−2	−2	−3	−2	−2	0	1	1
1940-1941	−3	0	2	4	6	8	10	10	8	5	3	1	0
1942-1943	3	2	2	0	1	0	−2	−2	−3	−3	−2	−4	−2
1944-1945	0	−2	−1	0	0	0	−2	−2	−3	−5	−5	−3	−1
1946-1947	1	−1	−2	−2	−2	−1	1	2	2	3	2	4	6
1948	1												

Tbilisi

Declination D (minutes)

	12	13	14	15	16	17	18	19	20	21	22	23	24
1938-1939	−0.3	−0.2	−0.1	0.0	0.1	0.1	−0.1	−0.2	−0.1	−0.1	−0.1	−0.2	0.0
1940-1941	−0.1	0.0	0.2	0.4	0.7	0.8	0.9	1.0	0.8	0.7	0.4	0.3	0.1
1942-1943	0.0	0.0	0.0	0.0	−0.1	−0.1	−0.2	−0.2	−0.2	−0.1	0.0	0.0	0.1
1944-1945	0.0	0.0	0.0	0.0	−0.2	0.0	0.0	−0.2	−0.1	−0.2	−0.2	−0.2	−0.2
1946-1947	0.2	0.2	0.1	0.2	0.0	0.2	0.0	0.0	0.0	−0.2	−0.1	−0.2	0.0
1948	0.1												

	1	2	3	4	5	6	7	8	9	10	11
Horizontal component H (gammas)											
1938—1939	−2	−5	−5	−3	−3	−3	0	3	2	2	2
1940—1941	−4	−3	−2	−2	−2	−1	0	1	3	4	3
1942—1943	3	4	5	4	4	4	2	2	2	2	2
1944—1945	−4	−2	2	4	5	7	7	5	5	3	3
1946—1947	−4	−4	−6	−6	−6	−6	−5	−4	−3	−1	1
1948	1	1	2	3	4	4	4	3	0	−1	−2
Inclination I (minutes)											
1938—1939	0.4	0.3	0.4	0.3	0.3	0.2	0.0	−0.4	−0.4	−0.4	−0.4
1940—1941	0.1	−0.1	−0.1	0.0	0.0	0.2	0.0	0.0	0.0	−0.2	0.0
1942—1943	0.0	−0.2	−0.3	−0.4	−0.4	−0.6	−0.4	0.4	−0.3	−0.3	−0.1
1944—1945	0.3	0.2	0.2	−0.1	−0.1	−0.3	−0.3	−0.2	−0.2	−0.2	−0.2
1946—1947	0.2	0.0	0.1	0.3	0.2	0.3	0.3	0.4	0.4	0.3	0.2
1948	−0.4	−0.2	−0.2	−0.2	−0.2	−0.2	−0.1	−0.1	0.0	0.0	0.1
Northern component X (gammas)											
1938—1939	−4	−4	−5	−4	−4	−2	0	2	3	2	2
1940—1941	−4	−3	−2	−2	−3	−1	1	2	3	4	4
1942—1943	2	3	4	4	4	4	3	1	1	2	2
1944—1945	−4	−2	2	4	5	6	8	6	5	4	4
1946—1947	−4	−4	−5	−7	−6	−6	−6	−6	−4	−1	1
1948	2	2	3	4	3	4	3	2	2	−1	−3
Eastern component Y (gammas)											
1938—1939	2	4	2	2	1	3	2	1	1	−1	−1
1940—1941	−2	−2	−4	−3	−4	−6	−4	−4	−3	−1	−2
1942—1943	0	0	−1	−1	0	0	0	0	0	0	1
1944—1945	0	1	2	2	1	0	0	0	−1	−1	0
1946—1947	−2	−2	−1	−2	0	0	1	2	2	2	2
1948	0	−2	0	0	0	0	0	0	1	0	0
Vertical component Z (gammas)											
1938—1939	2	3	3	2	2	2	−2	−5	−7	−8	−10
1940—1941	−4	−4	−6	−3	−3	0	2	2	3	4	5
1942—1943	2	2	1	−2	−5	−8	−10	−8	−8	−4	1
1944—1945	2	2	4	4	5	4	4	4	2	0	1
1946—1947	−2	−4	−4	−4	−2	−2	1	3	6	8	8
1948	−6	−6	−4	−2	−1	1	0	1	2	1	−1
Total intensity F (gammas)											
1938—1939	2	0	−1	0	−2	−1	−4	−4	−6	−7	−7
1940—1941	−4	−5	−6	−4	−2	−2	2	2	3	6	6
1942—1943	4	5	4	0	−2	−5	−7	−6	−5	−2	0
1944—1945	−2	0	4	6	8	9	8	9	8	8	6
1946—1947	−5	−6	−7	−7	−5	−3	−2	0	4	6	8
1948	−5	−5	−2	0	0	3	4	5	3	4	2

	12	13	14	15	16	17	18	19	20	21	22	23	24
Horizontal component H (gammas)													
1938-1939	1	2	2	2	3	3	4	2	0	−1	−3	−2	−2
1940-1941	3	2	2	−2	−2	−4	−4	−5	−5	−3	−1	−1	1
1942-1943	0	2	0	0	−2	−1	−3	−3	−3	−4	−6	−6	−4
1944-1945	4	2	2	1	1	0	1	2	1	1	0	−1	−3
1946-1947	3	4	5	3	2	−2	−2	−3	−3	−2	0	0	0
1948	−4												
Inclination I (minutes)													
1938-1939	−0.4	−0.2	−0.2	−0.3	−0.3	−0.2	−0.4	−0.2	−0.1	0.0	0.2	0.2	0.2
1940-1941	−0.1	−0.2	0.0	0.3	0.4	0.4	0.4	0.4	0.4	0.2	0.2	0.1	0.1
1942-1943	−0.1	0.0	0.0	0.2	0.1	0.2	0.2	0.4	0.5	0.5	0.5	0.5	0.5
1944-1945	−0.2	−0.2	−0.2	−0.2	−0.2	−0.2	−0.2	−0.3	−0.2	−0.3	−0.2	0.0	0.0
1946-1947	0.1	0.1	0.2	0.2	0.2	0.4	0.4	0.3	0.2	0.0	−0.2	−0.3	−0.4
1948	0.2												
Northern component X (gammas)													
1938-1939	2	2	4	4	4	4	4	1	−1	−2	−3	−3	−3
1940-1941	4	3	0	−1	−3	−4	−6	−6	−5	4	−2	−1	0
1942-1943	0	1	1	0	−2	−2	−2	−2	−3	−4	−5	−5	−5
1944-1945	3	1	2	2	1	1	0	1	2	1	0	−1	−2
1946-1947	3	4	5	2	2	−1	−3	−4	−3	−2	0	0	1
1948	−4												
Eastern component Y (gammas)													
1938-1939	−2	−1	−1	0	0	0	−1	−1	0	0	−1	0	−1
1940-1941	−1	0	2	4	4	6	6	6	5	5	3	3	0
1942-1943	0	0	0	0	0	−1	−1	−1	−1	−1	−1	0	0
1944-1945	0	0	0	0	−1	0	−1	0	0	−2	−1	−2	−2
1946-1947	2	2	1	1	2	0	0	0	2	−1	0	−2	−2
1948	0												
Vertical component Z (gammas)													
1938-1939	−7	−3	−2	−1	−1	−1	−3	−3	−2	−1	0	0	0
1940-1941	3	4	4	5	5	3	4	4	2	3	2	2	4
1942-1943	0	0	0	1	1	3	1	4	6	6	6	4	2
1944-1945	−1	0	−2	−2	−3	−5	−5	−6	−6	−6	−5	−6	−4
1946-1947	10	12	12	12	11	10	7	2	−1	−4	−8	−8	−9
1948	−1												
Total intensity F (gammas)													
1938-1939	−5	−3	−1	0	1	1	0	−1	−1	−1	−2	−1	2
1940-1941	6	4	3	3	3	2	2	0	0	1	1	2	3
1942-1943	1	2	1	2	2	2	4	2	2	−1	−4	−4	3
1944-1945	4	2	−1	−4	−4	−6	−6	−6	6	−6	−6	−5	−6
1946-1947	16	11	12	12	10	6	4	0	−3	−6	−8	−7	−5
1948	0												

	1	2	3	4	5	6	7	8	9	10	11
Tashkent											
Inclination D (minutes)											
1938—1939	−0.1	−0.2	−0.2	−0.1	0.0	0.1	0.1	0.0	0.1	0.1	0.2
1940—1941	0.0	−0.2	−0.2	−0.2	−0.2	−0.3	−0.2	−0.2	−0.2	−0.2	−0.2
1942—1943	0.1	−0.1	0.0	−0.1	−0.2	−0.2	−0.1	−0.1	−0.2	−0.2	−0.3
1944—1945	0.1	0.0	0.0	−0.2	−0.2	−0.4	−0.2	−0.4	−0.2	−0.4	−0.2
1946—1947	−0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.2	0.2
1948	−0.1	0.0	0.0	0.0	−0.1	−0.1	0.0	0.0	0.0	0.1	0.1
Horizontal component H (gammas)											
1938—1939	1	0	−4	−4	−4	−6	−3	−1	−1	−2	1
1940—1941	−1	0	0	0	−2	−2	0	2	2	2	3
1942—1943	0	2	2	3	4	4	5	4	5	5	5
1944—1945	−5	−4	−1	1	4	4	4	4	3	2	2
1946—1947	−2	−4	−5	−6	−8	−9	−8	−6	−4	−2	2
1948	−1	0	2	3	4	4	3	2	0	−2	−2
Inclination I (minutes)											
1938—1939	0.1	0.3	0.3	0.4	0.4	0.4	0.2	0.1	0.0	0.2	0.2
1940—1941	0.1	0.0	0.0	0.2	0.2	0.3	0.2	0.0	0.1	0.0	−0.2
1942—1943	0.2	0.0	−0.1	−0.2	−0.2	−0.2	−0.2	−0.2	−0.4	−0.4	−0.2
1944—1945	0.2	0.2	0.0	−0.1	−0.2	−0.2	−0.2	−0.3	−0.1	0.2	−0.2
1946—1947	0.1	0.1	0.3	0.4	0.4	0.4	0.5	0.6	0.4	0.2	0.0
1948	−0.2	0.0	−0.1	−0.2	−0.2	−0.2	0.0	−0.1	0.0	0.2	0.0
Northern component X (gammas)											
1938—1939	1	0	−3	−3	−4	−4	−4	2	−1	3	−2
1940—1941	−5	0	0	1	0	−1	0	2	2	2	3
1942—1943	−1	1	3	2	4	4	5	4	4	4	4
1944—1945	−4	−4	−1	1	3	4	3	3	2	2	2
1946—1947	−1	−3	−6	−7	−9	−8	−8	−7	−4	−1	2
1948	−1	0	2	3	4	4	3	3	0	−2	−2
Eastern component Y (gammas)											
1938—1939	−1	−2	0	−2	0	1	0	0	1	0	1
1940—1941	−1	−3	−3	−3	4	−1	2	−2	−3	−2	−1
1942—1943	0	0	−1	0	−1	0	−1	−1	−1	0	−2
1944—1945	0	−1	0	−2	−2	−2	−2	−2	−2	−1	−1
1946—1947	0	0	−1	0	0	−1	0	0	0	2	2
1948	0	0	0	−1	0	0	0	−1	0	0	0
Vertical component Z (gammas)											
1938—1939	5	4	4	4	3	2	2	1	0	0	0
1940—1941	1	2	6	6	7	7	6	4	5	3	2
1942—1943	1	2	0	2	0	0	−1	0	−1	−2	0
1944—1945	−1	0	−2	−1	−1	−1	−1	0	−2	0	0
1946—1947	−1	−1	0	0	0	2	2	4	5	6	3
1948	−2	−2	−1	−1	0	0	1	1	1	3	2
Total Intensity F (gammas)											
1938—1939	5	4	2	2	2	0	1	1	0	0	0
1940—1941	1	2	5	6	6	4	6	4	5	3	3
1942—1943	2	1	1	1	2	1	2	2	0	2	0
1944—1945	−3	−2	−2	−1	0	1	1	0	1	0	1
1946—1947	−2	−3	−4	−3	−3	−3	−1	−1	2	3	5
1948	−3	−1	0	0	2	2	2	2	3	2	2

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Tashkent

Inclination D (minutes)

	12	13	14	15	16	17	18	19	20	21	22	23	24
1938-1939	0.3	0.3	0.4	0.4	0.4	0.2	0.3	0.1	0.2	0.1	0.2	0.0	0.0
1940-1941	—0.2	—0.1	0.0	0.1	0.1	0.2	0.2	0.2	0.2	0.4	0.1	0.1	0.0
1942-1943	—0.3	—0.2	—0.3	—0.2	—0.1	—0.1	0.0	0.0	0.2	0.1	0.1	0.1	0.1
1944-1945	—0.2	—0.2	—0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	—0.1	—0.1	—0.1
1946-1947	0.1	0.0	—0.1	—0.1	—0.1	—0.1	0.0	—0.1	—0.1	—0.1	—0.1	—0.2	—0.1
1948	0.1												

Horizontal component H (gammas)

	12	13	14	15	16	17	18	19	20	21	22	23	24
1938-1939	—3	—4	—3	—2	1	—3	—5	—6	—7	—8	—4	0	2
1940-1941	5	5	5	2	0	0	—3	—3	—3	—2	—1	—2	—3
1942-1943	3	4	2	1	0	—2	0	—2	—2	—4	—5	—6	—5
1944-1945	2	2	0	2	4	2	4	4	5	3	2	2	1
1946-1947	3	5	6	4	4	0	0	0	—2	—2	—1	—2	—2
1948	—3												

Inclination I (minutes)

	12	13	14	15	16	17	18	19	20	21	22	23	24
1938-1939	0.1	0.1	0.1	—0.1	—0.2	—0.5	—0.5	—0.6	—0.4	—0.3	—0.2	—0.2	0.0
1940-1941	—0.3	—0.2	0.0	0.0	0.2	0.2	0.3	0.3	0.4	0.4	0.4	0.3	0.2
1942-1943	—0.3	—0.1	—0.1	—0.1	0.0	0.1	0.0	0.2	0.2	0.3	0.2	0.3	0.3
1944-1945	0.0	0.0	0.0	—0.2	—0.1	—0.3	—0.3	—0.1	—0.5	—0.3	—0.3	—0.1	0.1
1946-1947	—0.2	—0.2	—0.3	—0.2	—0.1	0.0	0.0	0.1	0.2	0.0	0.0	—0.1	0.0
1948	0.2												

Northern component X (gammas)

	12	13	14	15	16	17	18	19	20	21	22	23	24
1938-1939	—3	—4	—4	—3	0	1	1	1	—1	—4	—9	—9	—10
1940-1941	4	4	1	0	—2	—2	—6	—6	—6	—5	—4	—4	2
1942-1943	5	3	3	1	—1	0	2	—2	—1	—4	—4	—6	—5
1944-1945	1	1	2	2	2	3	3	5	4	4	1	3	1
1946-1947	4	5	6	5	2	1	1	0	—3	—2	—1	0	—1
1948	—3												

Eastern component Y (gammas)

	12	13	14	15	16	17	18	19	20	21	22	23	24
1938-1939	0	2	1	1	1	2	1	1	1	1	0	0	0
1940-1941	1	—2	0	1	—1	0	1	2	1	0	1	1	0
1942-1943	—2	—1	—2	0	—2	0	0	0	0	0	2	0	1
1944-1945	—2	—2	—1	—1	0	0	0	0	0	—1	—1	0	0
1946-1947	0	0	0	—1	0	0	0	0	0	—1	—1	—2	—1
1948	0												

Vertical component Z (gammas)

	12	13	14	15	16	17	18	19	20	21	22	23	24
1938-1939	0	0	—3	—4	—8	—11	—14	—14	—12	—9	—7	—4	—1
1940-1941	0	0	1	6	1	1	2	3	3	2	2	2	2
1942-1943	—1	0	0	0	0	0	0	0	1	0	1	0	—1
1944-1945	1	2	2	0	0	—2	—3	—4	—4	—3	—3	—2	—2
1946-1947	3	3	1	1	2	1	1	2	0	—1	—2	—3	—3
1948	2												

Total Intensity F (gammas)

	12	13	14	15	16	17	18	19	20	21	22	23	24
1938-1939	0	—2	—4	—1	—6	—8	—12	—12	—10	—7	—6	—4	—2
1940-1941	1	1	3	2	0	0	—1	—1	0	0	0	1	2
1942-1943	1	2	1	0	0	—1	0	—1	—2	1	—1	—2	—3
1944-1945	[illegible]	2	2	1	—1	—1	—1	—1	—1	—2	—1	—1	—1
1946-1947	5	1	4	3	3	2	2	1	—1	—3	—3	—3	[illegible]
1948	1												

TABLE 10

AVERAGED LONG-PERIOD VARIATIONS

Observatory		1	2	3	4	5	6	7	8	9	10	11
Declination D (minutes)												
Yakutsk	[1]	-0.02	-0.08	-0.03	0.02	0.07	0.07	0.05	0.18	0.10	0.03	0.00
Sverdlovsk	[2]	-0.07	0.02	-0.03	-0.05	-0.10	-0.08	-0.10	-0.08	-0.13	-0.12	-0.12
Kazan'	[3]	0.15	0.07	0.05	0.03	0.05	0.00	-0.05	-0.13	-0.10	-0.13	-0.15
Irkutsk	[4]	0.03	-0.03	-0.03	-0.02	-0.03	-0.05	-0.02	-0.03	-0.02	-0.05	-0.03
Tbilisi	[5]	0.02	0.00	-0.05	-0.07	-0.08	-0.10	-0.05	-0.08	-0.07	0.02	-0.02
Tashkent	[6]	-0.02	0.08	-0.07	-0.10	-0.12	-0.15	-0.07	-0.10	-0.05	0.07	-0.03
Horizontal component H (gammas)												
Yakutsk	[1]	-1.3	-1.2	-0.8	0.5	0.2	0.3	0.7	0.8	0.5	0.3	1.0
Sverdlovsk	[2]	-1.3	-1.3	-0.5	0.2	-0.2	-0.5	0.3	0.3	0.3	0.5	0.8
Kazan'	[3]	-2.0	-1.2	-1.0	-0.5	-0.2	0.2	0.3	0.8	1.0	0.7	1.0
Irkutsk	[4]	-1.2	-0.7	0.0	0.2	0.8	0.5	0.8	1.2	1.0	0.7	1.5
Tbilisi	[5]	-1.7	-1.5	-0.7	0.0	0.3	0.8	1.3	1.7	1.5	1.5	1.5
Tashkent	[6]	-1.3	-1.0	-1.0	-0.5	-0.3	-0.8	0.2	0.8	0.8	0.5	1.0
Inclination I (minutes)												
Yakutsk	[1]	—	—	—	—	—	—	—	—	—	—	—
Sverdlovsk	[2]	0.12	0.10	0.07	0.03	0.02	0.00	0.00	-0.02	-0.07	-0.02	-0.05
Kazan'	[3]	0.07	0.10	0.05	0.00	-0.05	-0.03	-0.10	-0.12	-0.07	-0.07	-0.08
Irkutsk	[4]	0.10	0.02	0.00	-0.04	-0.10	-0.12	-0.10	-0.06	0.06	0.00	0.22
Tbilisi	[5]	0.10	0.00	0.02	-0.02	-0.03	-0.07	0.08	-0.12	-0.08	-0.13	-0.07
Tashkent	[6]	0.08	0.10	0.07	0.08	0.07	0.08	0.08	0.02	0.00	0.00	-0.07
Northern component X (gammas)												
Yakutsk	[1]	-1.3	-0.8	-0.8	0.3	0.3	0.2	0.5	1.2	1.0	0.8	0.5
Sverdlovsk	[2]	-1.5	-1.2	-1.0	-0.7	0.0	0.2	0.0	0.3	0.5	0.8	1.3
Kazan'	[3]	-1.5	-1.5	-0.7	-0.5	0.3	0.7	1.2	1.5	1.2	1.7	1.2
Irkutsk	[4]	-1.7	-0.7	-0.3	0.2	0.7	1.0	1.5	1.3	1.0	1.0	1.5
Tbilisi	[5]	-2.0	-1.3	-0.5	-0.2	-0.2	0.8	1.5	1.2	1.7	1.7	1.7
Tashkent	[6]	-1.8	-1.0	-0.8	-0.5	-0.3	-0.2	-0.2	0.5	0.5	0.3	1.2
Eastern component Y (gammas)												
Yakutsk	[1]	0.0	0.3	0.3	0.3	0.8	0.0	-0.3	0.5	0.2	0.0	-0.2
Sverdlovsk	[2]	-0.2	-0.3	0.0	-0.5	-0.7	0.0	-0.7	-0.5	-0.5	-0.7	-0.3
Kazan'	[3]	0.5	0.2	0.3	0.2	0.5	0.0	-0.2	-0.3	0.0	-0.2	0.0
Irkutsk	[4]	-0.2	-0.3	-0.2	-0.3	-0.3	0.0	-0.2	-0.2	-0.2	-0.2	-0.2
Tbilisi	[5]	-0.3	-0.2	-0.3	-0.2	-0.3	-0.5	-0.2	-0.2	0.0	0.0	0.2
Tashkent	[6]	-0.3	-1.0	-0.8	-1.3	-1.2	-0.7	-0.8	-1.0	-0.8	-0.2	-0.2
Vertical component Z (gammas)												
Yakutsk	[1]	—	—	—	—	—	—	—	—	—	—	—
Sverdlovsk	[2]	0.8	0.2	0.2	0.5	-0.2	0.2	-0.5	0.0	0.2	0.2	0.0
Kazan'	[3]	-0.8	-1.5	-0.8	-0.8	-1.2	-0.8	-0.3	-0.2	0.2	0.7	0.7
Irkutsk	[4]	1.8	1.8	1.2	0.0	-0.4	-0.8	-1.6	-2.8	-0.1	0.2	2.4
Tbilisi	[5]	-1.0	-1.2	-1.0	-0.8	-0.7	-0.5	-0.8	0.5	-0.3	0.2	0.3
Tashkent	[6]	0.5	0.8	1.2	1.7	1.5	1.7	1.5	1.7	1.3	1.7	1.2
Total intensity F (gammas)												
Yakutsk	[1]	—	—	—	—	—	—	—	—	—	—	—
Sverdlovsk	[2]	-2.5	-2.5	-3.0	-3.3	-3.2	3.8	-3.5	-2.0	0.0	-0.2	-0.5
Kazan'	[3]	-1.8	-1.7	-1.2	-1.2	-1.0	-0.5	0.2	0.5	0.8	1.0	1.2
Irkutsk	[4]	0.8	-0.2	0.0	-1.2	-1.0	-1.1	-2.0	-0.1	-0.8	-0.8	0.2
Tbilisi	[5]	-1.7	-1.8	-1.7	-0.8	-0.5	0.2	0.2	1.0	1.2	2.5	2.5
Tashkent	[6]	0.0	0.2	0.3	0.8	1.5	0.8	1.8	1.3	1.8	1.7	1.8

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	12	13	14	15	16	17	18	19	20	21	22	23	24

Declination D (minutes)

	12	13	14	15	16	17	18	19	20	21	22	23	24
[1]	0.02	0.00	−0.04	0.00	0.00	0.10	0.10	0.04	0.00	−0.04	−0.02	0.04	0.00
[2]	−0.15	−0.14	−0.16	−0.04	−0.02	0.02	0.00	0.06	0.04	−0.02	0.02	0.06	0.04
[3]	−0.13	−0.26	−0.18	−0.12	−0.06	−0.04	0.00	0.06	0.08	0.12	0.12	0.12	0.10
[4]	−0.05	−0.02	−0.04	−0.04	0.00	−0.02	−0.04	0.04	0.00	−0.02	−0.02	−0.06	−0.04
[5]	−0.02	0.00	0.04	0.12	0.10	0.20	0.12	0.08	0.08	0.02	0.00	−0.06	0.00
[6]	−0.03	−0.04	−0.02	0.04	0.06	0.04	0.10	0.04	0.10	0.10	0.04	−0.02	−0.02

Horizontal component H (gammas)

	12	13	14	15	16	17	18	19	20	21	22	23	24
[1]	0.5	1.0	1.2	0.6	0.0	−0.4	−0.8	−0.4	−1.0	−0.8	0.0	−0.8	0.0
[2]	0.7	1.0	1.2	0.4	0.0	0.4	−0.2	−0.8	−0.6	−1.4	−0.6	−1.4	−1.0
[3]	1.3	2.0	1.2	0.8	0.6	−0.4	−0.2	−1.0	−1.0	−1.4	−1.4	−1.6	−2.0
[4]	1.2	2.0	0.6	0.8	0.2	−0.6	−0.8	−0.8	−1.6	−1.4	−1.4	−1.0	−1.4
[5]	1.2	2.4	2.2	0.8	0.4	−0.8	−0.8	−1.4	−2.0	−1.8	−2.0	−2.0	−1.6
[6]	1.2	2.4	2.0	1.4	1.8	−0.6	−0.8	−0.8	−1.8	−2.6	−1.8	−1.6	−2.2

Inclination I (minutes)

	12	13	14	15	16	17	18	19	20	21	22	23	24
[1]	—	—	—	—	—	—	—	—	—	—	—	—	—
[2]	−0.08	−0.10	0.00	0.00	0.04	0.06	0.06	0.02	0.08	0.14	0.08	0.08	0.06
[3]	−0.05	−0.02	0.04	−0.02	0.06	0.06	0.08	0.08	0.14	0.22	0.16	0.14	0.10
[4]	0.14	−0.04	−0.06	0.00	0.04	0.06	0.10	0.14	0.08	0.12	0.10	0.12	0.08
[5]	−0.08	−0.10	−0.04	0.04	0.04	0.12	0.08	0.12	0.16	0.02	0.10	0.10	0.08
[6]	−0.08	−0.08	−0.06	−0.12	−0.04	−0.10	−0.10	−0.08	−0.02	0.08	0.02	0.04	0.08

Northern component X (gammas)

	12	13	14	15	16	17	18	19	20	21	22	23	24
[1]	1.0	1.6	1.2	0.6	−0.2	−0.2	−0.4	−0.6	−0.6	−0.6	−0.6	−0.4	−0.6
[2]	0.7	1.6	1.4	0.6	0.0	−0.4	−1.2	−1.2	−1.0	−1.4	1.0	−0.6	−1.4
[3]	0.7	1.6	1.4	0.0	−0.6	−0.4	−0.6	−1.2	−2.0	−2.4	−2.0	−1.8	−1.2
[4]	1.0	2.0	1.0	0.4	0.6	0.2	−0.8	−1.2	−1.4	−1.2	−0.8	−1.8	−1.0
[5]	1.3	2.2	2.4	1.4	0.4	−0.4	−1.4	−2.0	−2.0	−1.8	−2.0	−2.0	−1.8
[6]	1.0	1.8	1.6	1.0	0.2	0.4	−0.6	−0.4	−2.0	−2.2	−2.8	3.2	−3.4

Eastern component Y (gammas)

	12	13	14	15	16	17	18	19	20	21	22	23	24
[1]	−0.5	−0.6	−0.4	0.4	−0.4	−0.2	0.8	0.2	0.6	0.6	0.4	0.8	0.4
[2]	−0.3	−0.4	−0.4	−0.4	−0.4	0.0	0.2	0.2	0.0	0.0	0.0	0.0	0.0
[3]	−0.7	−0.8	−0.8	−0.6	−0.4	0.0	−0.4	−0.2	0.0	0.0	0.2	0.6	0.1
[4]	−0.3	−0.2	−0.2	−0.2	−0.2	−0.4	0.0	0.0	−0.4	−0.2	−0.4	−0.4	0.0
[5]	−0.2	0.2	0.4	1.0	0.8	1.0	0.6	0.8	0.4	0.2	0.0	−0.2	1.0
[6]	−0.8	−0.6	−0.4	0.0	−0.4	0.4	0.4	0.6	0.4	−0.2	0.2	−0.2	0.0

Vertical component Z (gammas)

	12	13	14	15	16	17	18	19	20	21	22	23	24
[1]	—	—	—	—	—	—	—	—	—	—	—	—	—
[2]	0.2	0.0	0.6	1.2	1.2	0.6	0.8	0.4	0.6	0.2	0.0	−0.2	−0.4
[3]	1.0	2.2	1.8	2.0	1.8	1.2	1.4	1.2	0.4	0.4	0.8	1.2	0.2
[4]	0.6	−0.8	0.0	0.6	0.6	1.2	1.8	2.2	1.4	0.8	0.6	0.0	0.8
[5]	0.7	2.6	2.4	3.0	2.6	2.0	1.4	0.2	−0.2	−0.4	−1.0	−1.6	−1.4
[6]	0.8	1.0	0.2	0.6	−1.0	−2.2	−2.8	−2.6	−2.4	−2.2	−1.8	−1.4	1.0

Total intensity F (gammas)

	12	13	14	15	16	17	18	19	20	21	22	23	24
[1]	—	—	—	—	—	—	—	—	—	—	—	—	—
[2]	0.8	1.0	0.8	0.8	0.2	0.6	1.0	0.6	0.8	0.2	−1.6	−3.6	4.0
[3]	1.3	3.0	2.8	2.0	1.6	1.4	0.6	0.4	0.4	0.0	−0.2	0.2	−0.6
[4]	0.4	−0.2	0.0	0.0	0.6	1.0	1.0	1.2	0.4	0.4	−0.4	−0.2	0.8
[5]	2.7	3.2	2.8	2.6	2.4	1.0	0.8	−1.0	−1.6	−2.6	−3.8	−3.0	−2.6
[6]	1.7	1.4	1.2	0.4	−0.8	1.6	−2.4	−2.8	−2.8	−2.2	−2.2	−1.8	−1.4

TABLE 11

ANNUAL GEOMAGNETIC VARIATIONS

(AVERAGE FOR 1938-1948)

Declination D (minutes)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Srednikan	−0.2	−0.3	−0.2	−0.2	−0.3	0.2	0.0	−0.2	−0.1	0.0	0.1	0.1
Yakutsk	0.2	0.1	−0.7	−0.7	−0.3	0.8	0.3	−0.4	−0.7	−0.7	−0.3	−0.7
Leningrad	0.6	0.6	0.5	0.4	0.0	−0.3	−0.4	−0.2	0.1	0.8	0.7	0.5
Sverdlovsk	0.3	0.3	0.9	0.3	−0.5	−1.0	−0.6	−0.3	0.3	0.7	0.4	0.5
Kazan'	0.5	0.5	0.9	0.5	−0.4	−0.8	−0.7	0.4	0.0	0.6	0.6	0.5
Moscow	0.7	0.5	0.5	0.0	−0.1	−0.4	−0.6	−0.2	0.3	1.6	0.8	−0.3
Irkutsk	−0.2	−0.1	−0.1	−0.2	−0.3	−0.3	0.2	−0.2	−0.2	−0.1	0.0	−0.1
Yuzhno-Sakhalinsk	0.1	0.0	0.2	−0.3	0.0	0.2	0.0	−0.3	−0.3	−0.5	−0.2	0.0
Odessa	0.6	0.6	0.3	0.3	0.2	−0.1	−0.1	−0.1	0.1	0.7	0.4	0.0
Tbilisi	0.4	0.3	0.4	0.1	−0.4	−0.4	−0.3	0.0	0.0	0.3	0.1	0.2
Tashkent	0.0	0.0	0.3	0.0	−0.3	−0.5	−0.3	−0.2	0.0	0.1	0.1	0.0

Horizontal component H (gammas)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Srednikan	−3	−1	−8	−5	1	12	11	3	−2	−7	0	1
Yakutsk	0	−1	−8	−1	5	11	8	2	−3	7	2	2
Leningrad	−2	−2	−4	−5	1	6	7	2	−3	−8	−3	−1
Sverdlovsk	−2	−1	−8	−5	5	11	7	1	−6	−8	−2	−1
Kazan'	0	−1	−8	−4	5	10	7	1	−7	−10	−3	0
Moscow	−3	−3	−5	2	1	10	8	0	−5	−15	−1	3
Irkutsk	2	2	−9	−5	4	11	6	0	−6	7	0	3
Yuzhno-Sakhalinsk	5	3	−3	−3	2	7	3	−1	−4	−8	0	1
Odessa	−1	−4	−1	−1	1	9	7	0	−1	−16	−3	2
Tbilisi	−1	0	−8	−2	5	9	4	0	−6	−6	−1	3
Tashkent	2	3	−8	3	5	14	8	3	−6	−7	−1	1

Inclination I (minutes)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Srednikan	−0.1	0.0	0.2	0.3	−0.3	−0.5	−0.6	0.0	0.5	0.5	0.1	0.1
Yakutsk	—	—	—	—	—	—	—	—	—		—	—
Leningrad	0.3	0.4	0.3	0.4	0.0	−0.4	−0.1	−0.3	0.2	0.7	0.3	0.2
Sverdlovsk	0.2	0.1	0.6	0.3	−0.2	−0.6	−0.4	0.0	0.1	0.5	0.2	0.1
Kazan'	0.1	0.2	0.6	0.3	−0.1	−0.6	−0.1	0.0	0.2	0.6	0.3	0.2
Moscow	0.3	0.4	0.3	0.4	0.0	−0.4	−0.4	−0.3	0.2	0.7	0.3	0.2
Irkutsk	−0.1	0.0	0.6	0.4	−0.2	−0.6	−0.4	0.0	0.4	0.5	0.0	−0.2
Yuzhno-Sakhalinsk	−0.2	0.0	0.3	0.2	0.0	−0.4	−0.2	−0.1	0.0	0.5	0.1	0.0
Odessa	0.3	0.5	0.2	0.2	0.0	−0.6	−0.6	−0.1	−0.1	1.6	0.4	0.1
Tbilisi	0.2	0.3	0.7	0.1	−0.5	−0.6	−0.4	−0.1	0.6	0.7	0.3	0.1
Tashkent	−0.1	−0.1	0.2	0.1	−0.2	−0.8	−0.4	0.0	0.6	0.7	0.3	0.1

Vertical component Z (gammas)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Srednikan	−7	−5	−5	10	−3	−9	−3	−1	8	10	7	11
Yakutsk	—	—	—	—	—	—	—	—	—		—	—
Leningrad	7	4	−2	1	0	−1	−1	0	2	6	3	5
Sverdlovsk	3	1	5	4	3	0	1	2	4	4	3	1
Kazan'	1	3	6	1	1	0	3	1	1	2	3	2
Moscow	1	1	3	1	1	−1	−4	3	4	12	8	1
Irkutsk	6	5	8	6	2	−1	−3	−2	2	6	1	2
Yuzhno-Sakhalinsk	6	6	1	−1	2	−2	−2	−5	−5	0	2	7
Odessa	7	9	5	4	2	−1	−6	−5	−5	10	7	6
Tbilisi	6	8	7	0	−3	0	−4	−2	7	8	6	10
Tashkent	4	2	3	3	1	0	0	2	3	5	6	3

Northern component X (gammas)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Srednikan	−5	−6	−1	−3	3	14	8	3	−2	−7	−2	1
Yakutsk	0	−1	−9	−5	4	12	8	2	−3	−6	−2	1
Leningrad	−2	−3	−4	−4	1	6	6	2	−3	−8	−4	−4
Sverdlovsk	−2	−1	−9	−5	5	12	7	1	−6	−8	−3	−2
Kazan'	−1	−2	−8	−4	1	9	7	1	−3	9	−4	−1
Moscow	−4	−3	−2	4	0	9	10	0	−5	−15	−5	3
Irkutsk	2	2	−9	−5	4	11	6	0	−6	−7	−1	3
Yuzhno-Sakhalinsk	5	3	−3	−4	2	6	3	−1	−4	−9	0	4
Odessa	−4	−6	−2	−2	−1	9	9	−1	−1	−14	−1	0
Tbilisi	−1	1	−9	−2	6	9	1	0	−5	−5	−1	3
Tashkent	3	3	−8	−3	5	13	8	3	−6	−7	1	2

Eastern component Y (gammas)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Srednikan	−3	−3	−3	−2	2	−1	0	−2	0	−1	0	1
Yakutsk	0	0	−1	−2	−3	0	−1	−2	−2	1	2	−2
Leningrad	2	2	2	1	0	−1	−1	−1	1	3	3	2
Sverdlovsk	1	1	2	0	1	−1	−1	−1	0	2	1	2
Kazan'	3	2	3	2	−2	−2	−2	−2	−1	1	2	2
Moscow	3	2	2	0	0	1	−1	−1	0	6	1	−2
Irkutsk	−1	0	−1	−1	1	−1	2	−1	−1	0	0	1
Yuzhno-Sakhalinsk	0	0	1	−2	−2	0	0	−2	0	−1	0	0
Odessa	5	4	1	2	1	0	−2	0	1	4	1	0
Tbilisi	3	2	2	1	−2	−2	−2	−1	−1	1	1	2
Tashkent	0	0	2	0	−2	−3	1	1	0	1	1	0

Total intensity F (gammas)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Srednikan	4	−1	−12	−21	−5	−7	−5	−3	7	13	14	25
Yakutsk	—	—	—	—	—	—	—		—		—	—
Leningrad	6	3	−3	0	−1	2	1	0	1	3	3	3
Sverdlovsk	4	3	4	4	5	5	1	3	1	1	4	2
Kazan'	1	0	2	2	1	4	5	1	−1	−1	2	2
Moscow	−3	−10	−1	7	10	10	0	1	0	6	6	1
Irkutsk	7	5	1	1	3	1	−3	−2	−1	3	4	3
Yuzhno-Sakhalinsk	8	7	2	−2	3	1	1	−5	−6	−4	2	8
Odessa	4	6	4	2	3	2	−3	−3	3	2	6	7
Tbilisi	3	5	0	−1	1	6	0	−1	1	3	5	11
Tashkent	4	3	−1	2	3	7	4	3	0	1	5	4

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TABLE 12

ANNUAL GEOMAGNETIC VARIATIONS

(Averages for Years of Low Magnetic Activity -- 1943, 1944)

Observatory	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Declination D (minutes)												
Srednikan	2	0	−1	0	6	10	9	−2	−6	−6	−2	−6
Yakutsk	2	2	0	−2	6	7	10	−1	−4	−6	−2	−2
Leningrad	−2	−2	−2	−4	0	2	6	0	−4	−3	−4	−5
Sverdlovsk	−2	0	−3	−2	5	10	9	−2	−1	6	−2	−8
Kazan'	2	2	0	−2	4	6	6	−2	−6	−8	−2	−6
Moscow	—	—	—	—	—	—	—	—	—	—	—	—
Irkutsk	1	4	0	−1	6	10	9	−4	−6	−5	2	−6
Yuzhno-Sakhalinsk	4	6	2	−4	2	7	9	−6	−10	−5	−3	2
Odessa	—	—	—	—	—	—	—	—	—	—	—	—
Tbilisi	1	5	4	0	2	8	8	−2	4	−4	−3	−6
Tashkent	1	5	0	−2	4	11	8	0	−2	−4	1	−7
Horizontal component H (gammas)												
Srednikan	−0.6	−0.5	−0.1	−0.4	−0.6	−0.8	0.6	0.0	0.6	0.4	0.0	0.3
Yakutsk	—	—	—	—	—	—	—	—	—	—	—	—
Leningrad	0.2	0.4	0.3	0.4	0.0	−0.3	−0.5	0.0	0.4	0.4	0.2	0.1
Sverdlovsk	0.2	0.0	0.2	0.0	−0.2	−0.4	−0.6	0.1	0.4	0.3	0.2	0.6
Kazan'	0.0	0.0	0.2	0.2	−0.2	−0.4	−0.4	0.0	0.2	0.5	0.2	0.7
Moscow	—	—	—	—	—	—	—	—	—	—	—	—
Irkutsk	0.0	−0.2	0.0	0.1	−0.3	−0.5	−0.6	0.2	0.2	0.3	0.0	0.4
Yuzhno-Sakhalinsk	0.0	−0.3	−0.3	0.1	0.1	−0.4	−0.5	0.2	0.4	0.6	0.4	0.6
Odessa	—	—	—	—	—	—	—	—	—	—	—	—
Tbilisi	0.2	0.2	0.2	0.3	0.0	0.1	−0.6	−0.2	−0.2	0.4	0.4	0.9
Tashkent	0.0	−0.2	0.0	0.1	−0.2	0.6	−0.6	0.2	0.2	0.3	0.2	0.6
Inclination I (minutes)												
Srednikan	—	—	—	—	—	—	—	—	—	—	—	—
Yakutsk	0.6	0.0	−0.7	−0.8	0.4	1.3	0.4	−0.3	−0.5	−0.2	0.3	1.0
Leningrad	0.6	0.6	0.3	0.4	−0.3	−0.2	−0.2	0.0	0.3	0.2	0.6	1.0
Sverdlovsk	0.2	0.0	0.2	0.1	−0.3	−0.8	−0.9	−0.2	0.0	0.4	0.6	1.4
Kazan'	0.4	0.0	0.1	0.3	−0.3	−0.7	−0.9	−0.5	−0.6	0.3	0.8	1.4
Moscow	—	—	—	—	—	—	—	—	—	—	—	—
Irkutsk	−0.1	0.0	−0.2	−0.4	−0.2	−0.2	0.0	−0.1	−0.1	−0.3	0.0	0.0
Yuzhno-Sakhalinsk	0.2	0.0	1.2	−0.3	0.1	0.1	0.2	−0.6	−0.2	−0.3	−0.6	−0.4
Odessa	—	—	—	—	—	—	—	—	—	—	—	—
Tbilisi	0.4	0.2	−0.4	−0.4	−0.4	−0.4	−0.6	0.0	−0.1	0.2	0.3	0.6
Tashkent	0.0	−0.2	−0.2	−0.3	−0.4	−0.4	−0.3	0.0	−0.4	0.0	0.2	0.1

Observatory	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Vertical component Z (gammas)												
Srednikan	−25	−28	−22	−27	−16	−12	0	0	12	8	−2	−3
Yakutsk	—	—	—	—	—	—	—	—	—	—	—	—
Leningrad	7	8	5	4	2	−5	−5	−2	8	9	2	1
Sverdlovsk	3	0	−1	−4	2	1	−2	0	7	0	6	2
Kazan'	8	10	8	3	4	0	0	−7	−6	0	4	14
Moscow	—	—	—	—	—	—	—	—	—	—	—	—
Irkutsk	4	3	2	5	2	0	−3	−5	−2	2	4	6
Yuzhno-Sakhalinsk	6	3	−1	−5	−7	−3	−1	−6	−5	6	4	18
Odessa	—	—	—	—	—	—	—	—	—	—	—	—
Tbilisi	10	11	12	8	3	1	−6	−6	2	2	6	12
Tashkent	4	2	−2	−1	0	4	1	8	1	4	4	5
Northern component X (gammas)												
Srednikan	2	1	0	1	7	—	10	−2	−4	−5	−1	−6
Yakutsk	2	2	−2	−4	6	8	10	−1	−4	−7	−2	−4
Leningrad	−1	−2	−2	−1	2	4	6	−1	−5	−4	−4	−2
Sverdlovsk	−2	0	−3	−2	5	10	10	−2	−4	−6	−2	−10
Kazan'	1	3	0	−2	3	7	7	−2	−4	−8	−2	−6
Moscow	—	—	—	—	—	—	—	—	—	—	—	—
Irkutsk	1	4	0	0	6	10	9	−4	−5	−4	0	−7
Yuzhno-Sakhalinsk	4	8	3	−4	3	6	8	−6	−10	−5	−4	−2
Odessa	—	—	—	—	—	—	—	—	—	—	—	—
Tbilisi	1	1	4	0	2	8	8	−2	1	−4	−4	−6
Tashkent	1	4	0	−2	5	12	9	1	0	−4	0	−8
Eastern component Y (gammas)												
Srednikan	−7	−4	−3	−3	1	—	−2	0	2	0	−2	−3
Yakutsk	2	−1	−4	−3	0	2	−2	0	−2	0	7	0
Leningrad	2	3	1	2	−1	0	−1	0	1	0	2	4
Sverdlovsk	0	0	0	0	0	−2	−2	−2	0	0	2	4
Kazan'	3	1	2	2	0	−1	−2	−2	−4	0	1	6
Moscow	—	—	—	—	—	—	—	—	—	—	—	—
Irkutsk	−1	0	−2	−2	−1	0	0	0	0	−2	0	0
Yuzhno-Sakhalinsk	0	−1	10	−2	0	0	0	−3	0	−2	−4	−3
Odessa	—	—	—	—	—	—	—	—	—	—	—	—
Tbilisi	2	2	−2	−2	−3	−2	−4	−1	0	2	2	4
Tashkent	0	−2	−2	−2	−2	−2	−1	0	−2	0	0	2
Total intensity F (gammas)												
Srednikan	—	—	—	—	—	—	—	—	—	—	—	—
Yakutsk	—	—	—	—	—	—	—	—	—	—	—	—
Leningrad	6	8	4	3	−2	−4	−1	−7	6	8	2	−2
Sverdlovsk	2	0	−2	−6	4	6	0	−1	6	−2	5	0
Kazan'	8	10	6	2	4	2	2	−7	−7	−4	4	11
Moscow	—	—	—	—	—	—	—	—	—	—	—	—
Irkutsk	4	4	3	4	4	4	0	−4	−4	1	4	4
Yuzhno-Sakhalinsk	6	6	−3	−5	8	1	3	−8	−9	3	2	16
Odessa	—	—	—	—	—	—	—	—	—	—	—	—
Tbilisi	2	9	2	11	6	10	6	0	4	−4	7	13
Tashkent	4	4	−2	−2	2	9	4	6	3	2	4	0

TABLE 13

ANNUAL GEOMAGNETIC VARIATIONS

(AVERAGES FOR YEARS OF HIGH MAGNETIC ACTIVITY -- 1938, 1947, 1948)

Observatory	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Declination D (minutes)												
Srednikan	—1.0	—0.5	0.0	—0.6	—1.1	0.6	0.2	—1.0	—0.4	—1.7	0.1	0.5
Yakutsk	—0.1	0.1	—0.3	—0.3	—0.2	0.5	0.5	—0.5	—1.0	—1.6	0.0	—0.1
Leningrad	1.6	1.2	0.4	0.6	0.2	—0.8	—0.6	—0.4	0.0	1.0	0.4	0.4
Sverdlovsk	1.1	0.3	1.0	—0.2	—0.4	—1.2	—1.1	0.0	0.6	1.4	0.5	0.3
Kazan'	1.2	0.5	1.1	0.5	—0.1	—1.0	—1.4	—0.4	0.3	1.1	1.0	—0.5
Moscow	0.6	0.3	0.5	—0.2	—0.2	—0.8	—0.7	0.0	0.6	1.6	0.8	0.2
Irkutsk	—0.2	—0.2	—0.1	—0.2	—0.3	—0.3	—0.4	—0.1	—0.1	0.0	0.1	—0.2
Yuzhno-Sakhalinsk	—0.2	—0.3	—0.2	—0.2	—0.3	0.0	0.2	—0.4	0.0	—0.5	0.1	0.2
Odessa	1.0	0.6	0.0	0.2	0.2	—0.1	—0.3	0.1	0.4	0.7	0.3	0.0
Tbilisi	0.9	0.3	0.5	0.1	—0.1	—0.7	—0.7	—0.1	—0.1	0.6	0.3	0.3
Tashkent	0.5	0.2	0.4	—0.1	0.2	—0.8	—0.6	0.1	0.2	0.4	0.1	0.1
Horizontal component H (gammas)												
Srednikan	—16	—5	0	—2	7	18	16	0	0	—9	—3	5
Yakutsk	—3	—1	—9	—1	4	13	12	1	—6	—13	—2	5
Leningrad	—12	—8	—3	—4	0	8	11	5	0	—10	—2	—2
Sverdlovsk	—8	—2	—7	—1	4	13	11	—2	—8	—12	—3	1
Kazan'	—6	—2	—8	—1	4	11	13	0	—8	—15	—1	2
Moscow	—1	—1	—3	3	0	12	4	—3	—8	—14	—2	2
Irkutsk	—5	1	—8	0	2	13	11	3	—9	—13	—3	3
Yuzhno-Sakhalinsk	—1	—6	—2	0	3	7	7	—3	—2	—12	2	4
Odessa	—10	—6	1	—2	0	10	7	—1	—1	—14	—1	0
Tbilisi	—8	—1	—7	6	8	13	10	—5	8	—16	—5	5
Tashkent	—2	5	—6	4	7	16	14	—1	—14	—20	—4	4
Inclination I (minutes)												
Srednikan	—0.3	—0.2	0.1	0.7	0.2	0.3	0.4	—0.4	0.5	1.2	—1.0	—1.6
Yakutsk	—	—	—	—	—	—	—	—	—	—	—	—
Leningrad	1.0	0.7	0.2	0.3	0.1	—0.6	—0.6	—1.2	0.0	0.9	—0.4	—0.4
Sverdlovsk	0.6	0.1	0.5	0.0	—0.2	—0.9	—0.7	0.1	0.6	1.0	0.3	0.0
Kazan'	0.3	0.1	0.7	0.0	0.4	—0.8	—1.0	0.0	0.5	1.0	0.3	0.0
Moscow	0.0	—0.2	0.2	—0.1	0.3	—0.6	—1.0	0.2	0.6	1.1	0.3	—0.2
Irkutsk	—0.1	0.0	0.9	0.0	—0.3	—0.8	—0.7	0.2	0.6	0.8	—0.1	—0.4
Yuzhno-Sakhalinsk	0.6	0.6	0.4	0.0	—0.3	—0.8	—0.8	—0.1	0.0	0.8	0.1	0.2
Odessa	1.0	0.8	0.1	0.2	0.1	—0.7	—0.6	0.0	0.0	1.5	0.2	0.2
Tbilisi	0.7	0.4	1.8	0.0	—0.7	—0.9	—1.0	0.3	0.9	1.3	0.5	—0.2
Tashkent	0.4	0.0	0.5	—0.3	—0.5	—1.1	—1.0	0.1	1.0	1.4	0.5	0.0
Vertical component Z (gammas)												
Srednikan	24	—7	—2	—10	5	—15	—6	—8	13	1	3	12
Yakutsk	—	—	—	—	—	—	—	—	—	—	—	—
Leningrad	6	6	1	0	—1	—2	1	1	—6	8	—3	12
Sverdlovsk	3	1	3	2	2	—5	—3	3	2	10	6	4
Kazan'	—3	—1	5	1	1	0	—3	1	4	4	10	6
Moscow	—3	—10	0	6	11	7	—6	2	4	10	8	0
Irkutsk	1	2	9	2	—1	—1	—7	1	5	9	6	7
Yuzhno-Sakhalinsk	8	10	10	1	—3	—10	—12	—8	—4	2	5	12
Odessa	10	12	4	4	5	0	—6	—4	—3	9	7	7
Tbilisi	7	9	13	10	—4	—3	—13	1	11	10	5	3
Tashkent	6	7	7	0	—1	—3	—6	2	5	9	8	7

Northern component X (gammas)

Observatory	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Srednikan	−2	−9	−2	−6	2	14	8	8	0	−15	−2	3
Yakutsk	−3	−2	−9	−1	3	13	12	3	−10	−14	−2	4
Leningrad	−12	−8	−4	−4	0	9	10	5	0	−10	−2	−2
Sverdlovsk	−9	−3	−8	−1	5	14	12	−2	−8	−13	−3	0
Kazan'	−6	−3	−9	−1	−8	13	16	1	−7	−15	−1	1
Moscow	−2	−1	−3	3	−1	13	15	−2	−8	−14	−3	2
Irkutsk	−5	1	−8	0	2	13	11	−3	−9	−13	−3	3
Yuzhno-Sakhalinsk	4	6	−2	4	3	7	8	−3	0	−12	2	4
Odessa	−10	−6	1	1	0	10	7	−1	−5	−14	−1	0
Tbilisi	−8	−2	−7	6	8	9	10	−5	−8	−16	−5	5
Tashkent	−2	5	−6	4	7	17	14	−1	−13	−20	−4	4

Eastern component Y (gammas)

Observatory	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Srednikan	−1	−2	−2	−2	−6	−2	0	−2	−3	−2	4	1
Yakutsk	1	1	1	−1	−2	−2	−1	−3	−6	−2	−1	−1
Leningrad	6	5	2	2	1	−3	−2	−2	0	2	1	2
Sverdlovsk	3	1	3	−1	0	−3	−2	0	1	4	1	2
Kazan'	5	2	3	2	−2	−2	−4	−2	1	3	5	3
Moscow	3	1	3	−1	−1	−2	−2	0	2	6	4	0
Irkutsk	0	−1	0	−1	−1	−2	−3	−1	−1	1	0	1
Yuzhno-Sakhalinsk	−2	−1	−2	−2	−3	−1	0	−3	0	−2	0	2
Odessa	6	4	0	2	−3	0	−2	0	1	4	1	0
Tbilisi	5	2	3	2	0	−4	−4	−1	−3	2	2	3
Tashkent	3	1	3	0	−1	−5	−3	1	0	2	1	1

Total intensity F (gammas)

Observatory	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Srednikan	26	16	−4	−16	2	−10	−16	−24	21	−8	2	28
Yakutsk	—	—	—	—	—	—	—	—	—	—	—	—
Leningrad	2	3	0	−2	0	0	3	2	−6	4	5	10
Sverdlovsk	0	−1	−2	3	0	1	1	−1	−3	5	6	4
Kazan'	−5	−1	3	0	−2	5	2	2	−2	−2	9	6
Moscow	−3	−10	−1	7	10	10	0	1	0	6	6	1
Irkutsk	2	3	4	2	1	3	−4	0	2	6	8	10
Yuzhno-Sakhalinsk	4	6	8	0	−2	−4	−7	−10	−4	−1	4	12
Odessa	4	8	4	3	4	5	−3	−3	−3	2	6	7
Tbilisi	3	7	9	11	2	3	−6	−2	−3	0	−1	−4
Tashkent	2	9	3	2	3	6	1	1	2	−1	5	8

TABLE 14

MAXIMUM DEVIATION FROM AVERAGES FOR 11-YEAR ANNUAL GEOMAGNETIC VARIATIONS

(NEGATIVE DEVIATIONS)

Observatory	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Horizontal component H (gammas)												
Srednikan	-13	-7	-16	-12	-20	-2	-8	-9	-7	-11	-3	11
Yakutsk	-10	-10	-16	-11	7	6	-10	-7	-15	13	-7	-9
Leningrad	-18	-6	-12	-6	-3	-6	-7	11	-9	-5	5	-5
Sverdlovsk	-18	-10	-12	-10	7	-5	-9	7	-12	-6	7	10
Kazan'	-15	-7	-13	-6	-5	-4	-6	-7	-9	-8	-12	8
Moscow	-8	-2	-3	-5	-2	-3	-13	-4	-10	-2	-2	-3
Irkutsk	-22	-15	-17	-12	-9	-8	-15	-9	-13	-10	-9	-13
Odessa	-19	-4	-3	7	-4	-3	6	7	-4	-6	-5	5
Tbilisi	-19	-11	-15	-13	-8	-7	-18	-11	-14	18	-10	-10
Tashkent	-19	-12	-20	-13	-10	-12	-18	-10	-22	17	-9	11
Vertical component Z (gammas)												
Srednikan	-37	-29	-19	-17	-18	-12	-23	-22	-38	-18	-33	-20
Yakutsk	—	—	—	—	—	—	—	—	—	—	—	—
Leningrad	-5	-13	-17	12	-9	-5	8	-9	-10	-7	-14	9
Sverdlovsk	-5	-8	-10	-13	-6	-7	-7	-4	-7	12	-6	-9
Kazan'	-10	-17	-12	-8	-10	-10	16	-12	-8	-19	-11	-13
Moscow	-4	-11	-3	-5	-6	-6	-4	-4	-7	-7	-6	3
Irkutsk	-9	-10	-8	-5	-8	-11	-9	-8	8	-14	-14	-21
Odessa	-10	-6	-1	-7	-4	-4	10	-4	-6	-4	-4	1
Tbilisi	-23	-10	-9	-16	-19	-8	-14	12	-7	-6	22	19
Tashkent	-11	-12	-9	-6	-8	-6	-8	8	7	8	5	-10
Total intensity F (gammas)												
Srednikan	-31	-35	-15	-8	-15	-19	-30	-21	-36	-21	-12	-12
Yakutsk	—	—	—	—	—	—	—	—	—	—	—	—
Leningrad	-5	-11	-20	-5	-6	-12	6	-15	-10	-8	-8	7
Sverdlovsk	-6	-10	-15	-14	-10	-7	-8	-7	-5	10	-6	-10
Kazan'	-9	-5	-6	-9	-13	-11	-13	-10	-9	19	-12	-12
Moscow	0	0	0	0	0	0	-1	-4	-3	-6	-5	-1
Irkutsk	-10	-8	-7	-4	-6	-12	-10	-9	-10	-11	-14	-19
Odessa	-1	-2	-1	-3	-6	-6	-8	-5	-1	-6	-4	-2
Tbilisi	-10	-7	-13	-17	-21	-10	-17	-12	-13	-10	-23	-20
Tashkent	-11	-12	-6	-8	-6	-7	-4	9	-8	-5	-6	-9

TABLE 15

MAXIMUM DEVIATION FROM AVERAGES FOR 11-YEAR ANNUAL GEOMAGNETIC VARIATIONS

(POSITIVE DEVIATIONS)

Observatory	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Srednikan	5	4	8	8	6	6	10	5	2	1	4	6
Yakutsk	4	4	9	9	9	4	7	8	10	9	12	5
Leningrad	9	4	6	5	3	7	12	6	8	6	5	6
Sverdlovsk	16	5	8	7	7	4	7	8	8	7	6	8
Kazan'	11	7	10	6	8	5	7	8	7	5	6	8
Moscow	5	2	2	3	2	2	9	5	6	3	2	2
Irkutsk	17	10	12	8	10	7	10	10	12	9	9	10
Odessa	14	7	4	6	5	6	8	3	7	7	3	5
Tbilisi	16	8	16	13	12	12	13	10	20	9	8	11
Tashkent	23	9	11	12	10	5	8	11	26	12	8	8

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	Vertical component Z (gammas) --											
Srednikan	43	34	25	30	23	19	8	17	22	22	25	25
Yakutsk	—	—	—	—	—	—	—	—	—	—	—	—
Leningrad	5	11	8	8	10	12	7	4	8	9	6	6
Sverdlovsk	6	13	11	15	6	6	7	5	7	11	11	6
Kazan'	10	7	13	25	15	10	18	25	17	13	9	19
Moscow	7	12	4	5	10	8	5	3	6	4	5	2
Irkutsk	22	12	14	12	7	6	8	8	11	9	6	10
Odessa	9	5	2	4	4	4	8	3	6	5	7	2
Tbilisi	15	11	16	17	13	19	25	10	9	13	18	13
Tashkent	10	11	18	12	9	11	13	8	5	7	5	7
	Total intensity F (gammas)											
Srednikan	48	25	9	10	26	14	13	21	23	17	17	9
Yakutsk	—	—	—	—	—	—	—	—	—	—	—	—
Leningrad	4	6	7	6	11	11	7	13	9	10	7	10
Sverdlovsk	17	15	17	14	11	15	19	17	6	11	16	15
Kazan'	10	11	7	22	15	8	26	16	11	13	8	13
Moscow	0	0	0	0	0	0	1	4	4	5	5	1
Irkutsk	22	12	10	13	10	7	7	8	7	7	8	9
Odessa	1	4	2	3	3	4	4	5	1	5	6	2
Tbilisi	8	12	20	19	12	15	17	14	12	14	13	15
Tashkent	9	15	8	11	7	11	4	9	9	7	4	6

TABLE 16

MAXIMUM DEVIATIONS FROM AVERAGES FOR 11-YEAR ANNUAL GEOMAGNETIC VARIATIONS

Observatory	Extreme values						Average from extreme years	Average values of maximum deviations		
	H		Z		F			H	Z	F
Srednikan	10	−16	43	−38	18	−36	9	±8	±24	±20
Yakutsk	10	−16	—	—	—	—	11	9		
Leningrad	12	−18	12	−17	13	−20	11	7	9	8
Sverdlovsk	16	−18	15	−9	19	−15	11	9	8	12
Kazan'	11	−15	25	−19	16	−19	11	8	11	12
Irkutsk	17	−22	22	−21	22	−19	11	12	10	10
Odessa	14	−19	9	−10	6	−8	5	6	5	4
Tbilisi	20	18	25	−23	20	−23	11	12	14	14
Tashkent	23	22	18	−12	15	−10	11	13	±9	±8

TABLE 17

SOLAR DAILY GEOMAGNETIC VARIATIONS OF DECLINATION (D) FOR QUIET DAYS (MINUTES). AVERAGES FOR 11 YEARS

Observatory	World time	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23		Amplitude
Yakutsk	Winter	0.4	−0.1	1.0	−1.6	−2.1	−2.0	−1.3	−0.7	−0.4	−0.4	−0.3	−0.1	0.2	0.5	0.6	0.8	1.0	1.0	1.0	1.0	0.9	0.8	0.8	1.0	3.1
	Equinox	2.2	0.8	−1.2	−3.5	−5.3	−5.8	−5.1	−3.8	−2.1	−1.0	−0.5	0.1	0.3	0.7	1.0	1.5	1.9	2.1	2.1	2.5	2.8	3.1	3.6	3.5	9.4
	Summer	2.7	−0.4	−3.6	−6.2	−7.8	−8.2	−7.2	−5.2	−3.0	−1.2	−0.1	0.4	0.4	0.3	0.4	0.7	1.3	2.3	3.4	4.7	6.0	7.1	7.1	6.0	15.3
	Year	1.8	0.2	−1.3	−3.8	−5.1	−5.3	−4.5	−3.2	−1.8	−0.9	−0.3	0.1	0.3	0.5	0.7	1.0	1.4	1.8	2.2	2.7	3.2	3.7	3.8	3.5	9.1
Leningrad	Winter	0.4	0.3	0.2	0.2	0.4	0.7	0.9	0.7	−0.1	−1.0	−1.9	−2.0	−1.6	−1.1	−0.8	−0.7	−0.4	−0.1	0.4	0.6	0.8	0.7	0.7	0.5	2.9
	Equinox	0.8	1.0	1.3	1.7	2.4	3.3	3.6	2.6	0.4	−2.3	−4.2	−4.7	−3.9	−2.5	−1.2	−0.7	−0.6	−0.4	−0.1	0.2	0.3	0.4	0.5	0.6	8.3
	Summer	1.7	2.7	4.1	5.2	5.9	6.2	5.2	3.2	0.1	−3.5	−6.3	−7.2	−6.4	−4.6	−2.7	−1.4	−1.0	−1.0	−1.0	−0.8	−0.6	−1.0	0.5	0.8	13.4
	Year	1.0	1.3	1.9	2.4	2.9	3.4	3.2	3.2	0.1	−2.3	−4.1	−4.6	−4.0	−2.7	−1.6	−0.9	−0.7	−0.5	−0.2	0.0	0.2	0.0	0.6	0.6	8.0
Sverdlovsk	Winter	0.4	0.2	0.2	0.5	1.0	1.1	0.4	−0.6	−1.4	−1.9	−1.6	−1.0	−0.6	−0.4	−0.3	−0.3	0.0	0.4	0.7	0.8	0.8	0.7	0.6	0.3	3.0
	Equinox	1.3	1.7	2.7	4.2	5.3	5.1	3.2	0.0	−3.1	−5.1	−5.5	−4.4	−2.8	−1.6	−1.2	−0.9	−0.6	−0.3	0.1	0.3	0.4	0.4	0.6	0.6	10.8
	Summer	3.5	5.1	6.5	7.1	[illegible]	5.4	2.6	−0.9	−4.3	−6.6	−7.3	−6.6	−4.8	−2.8	−1.6	−1.3	−1.4	−1.3	−1.0	−0.5	0.0	0.5	1.0	1.8	14.4
	Year	1.7	2.4	3.1	3.9	4.4	3.9	2.1	−0.5	−2.9	−4.5	−4.7	−4.0	−2.7	−1.6	−1.0	−0.8	−0.7	−0.6	−0.1	0.2	0.4	0.5	0.7	0.9	9.1
Kazan'	Winter	0.5	0.3	0.2	0.3	0.7	1.1	1.0	0.2	−0.7	−1.5	−1.8	−1.5	−1.0	−0.7	−0.6	−0.4	−0.3	0.1	0.5	0.7	0.9	0.8	0.6	[illegible]	2.9
	Equinox	1.0	1.2	1.8	2.6	4.1	4.7	4.2	2.0	−1.1	−3.7	−5.1	−4.9	−3.5	−2.1	−1.2	−1.0	−0.7	−0.4	0.0	0.1	0.3	0.4	0.6	0.5	[illegible]
	Summer	2.2	3.4	4.8	5.8	6.3	5.8	4.3	1.5	−2.0	−4.9	−6.4	−6.5	−5.4	−3.5	−2.0	−1.2	−1.2	−1.1	−0.9	−0.6	−0.2	0.2	0.7	1.2	[illegible]
	Year	1.2	1.6	2.3	2.9	3.7	3.9	3.2	1.2	−1.3	−3.4	−4.4	−4.3	−3.3	−2.1	−1.3	−0.9	−0.7	−0.5	−0.1	0.1	0.3	0.5	0.6	1.1	8.3
Irkutsk	Winter	0.2	1.1	1.7	1.0	0.1	−0.9	−1.5	−1.4	−1.1	−0.4	−0.2	−0.2	−0.1	0.0	0.1	0.2	0.3	0.4	0.4	0.3	0.3	0.1	0.1	0.1	2.8
	Equinox	3.0	4.1	4.1	2.7	0.3	−2.3	−4.1	−4.6	−3.7	−2.3	−1.2	−0.8	−0.6	−0.5	−0.4	−0.1	0.2	0.4	0.7	0.8	0.8	0.8	1.1	1.7	8.7
	Summer	6.4	6.0	4.4	1.6	−1.4	−4.2	−5.9	−6.4	−5.5	−3.9	−2.1	−0.8	−0.5	−0.6	−0.7	−0.6	−0.4	0.1	0.4	0.9	1.4	2.5	4.0	5.6	12.8
	Year	3.2	3.7	3.4	1.8	−0.3	−2.5	−3.8	−4.1	−3.4	−2.2	−1.2	−0.6	−0.4	−0.4	−0.3	−0.2	0.0	0.3	0.5	0.7	0.8	1.1	1.7	1.5	7.8
Vladivostok	Winter	1.5	1.0	0.3	−1.2	−1.7	−1.6	−0.9	−0.3	0.0	−0.1	−0.1	0.0	0.1	0.0	0.1	0.1	0.2	0.2	0.3	0.3	0.3	0.2	0.5	1.4	3.2
	Equinox	2.9	1.5	−0.6	−2.5	−3.3	−3.3	−2.3	−1.1	−0.4	−0.3	−0.3	−0.2	−0.2	−0.1	0.0	0.3	0.5	0.6	0.7	0.8	0.9	1.3	2.2	3.1	6.4
	Summer	2.7	0.7	−1.7	−3.5	−4.5	−4.4	−3.4	−2.2	−1.1	−0.3	−0.2	−0.2	−0.2	−0.2	−0.1	0.1	0.5	0.8	1.0	1.5	2.3	3.6	4.4	4.4	8.9
	Year	2.4	1.1	−0.7	−2.4	−3.2	−3.1	−2.2	−1.2	−0.5	−0.2	−0.2	−0.1	−0.1	−0.1	0.0	0.2	0.4	0.5	0.7	0.9	1.2	1.7	2.4	3.0	6.2
Tbilisi	Winter	0.3	0.2	0.1	0.1	0.4	1.1	1.3	0.6	−0.6	−1.5	−1.5	−1.1	−0.7	−0.5	−0.4	−0.2	−0.2	0.0	0.3	0.4	0.6	0.5	0.5	0.3	2.3
	Equinox	0.7	0.7	0.9	1.7	3.1	4.1	3.5	1.4	−1.2	−3.2	−4.0	−3.6	−2.6	−1.5	−0.9	−0.7	−0.6	−0.2	0.0	0.2	0.3	0.4	0.5	0.5	8.1
	Summer	0.9	1.4	2.6	3.9	4.6	4.3	3.0	0.8	−1.7	−3.5	−4.4	−4.3	−3.6	−2.2	−1.0	−0.5	−0.7	−0.6	−0.3	−0.1	0.1	0.3	0.5	0.6	9.0
	Year	0.6	0.8	1.2	1.9	2.7	3.2	2.4	0.9	−1.2	−2.7	−3.3	−3.0	−2.3	−1.1	−0.8	−0.5	−0.5	−0.3	0.0	0.2	0.3	0.4	0.5	0.5	6.5
Tashkent	Winter	0.1	−0.2	0.0	0.7	1.3	1.0	0.0	−0.9	−1.3	−1.0	−0.5	−0.2	−0.1	−0.1	−0.1	−0.1	0.1	0.2	0.3	0.3	0.3	0.2	0.1	−0.1	2.6
	Equinox	0.6	1.0	2.2	3.7	3.9	2.6	0.1	−2.2	−3.5	−3.6	−2.6	−1.4	−0.7	−0.6	−0.6	−0.4	−0.2	0.0	0.2	0.3	0.4	0.4	0.4	0.3	7.5
	Summer	2.0	3.5	4.5	4.8	3.8	1.3	−0.7	−2.9	−4.1	−4.4	−3.9	−2.9	−1.5	−0.6	−0.6	−0.6	−0.5	−0.3	−0.1	0.2	0.4	0.5	0.7	1.0	9.2
	Year	0.8	1.4	2.2	3.1	3.0	1.8	−0.2	−2.0	−3.0	−3.0	−2.3	−1.5	−0.8	−0.4	−0.4	−0.4	−0.2	0.0	0.1	0.3	0.4	0.4	0.4	0.4	6.1

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TABLE 18

SOLAR DAILY GEOMAGNETIC VARIATIONS OF HORIZONTAL COMPONENT (H) FOR QUIET DAYS (GAMMAS). AVERAGE FOR 11 YEARS

Observatory	World time	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23		Amplitude
Yakutsk	Winter	−4	−7	−9	−8	−5	0	2	3	3	2	1	1	1	1	1	1	2	1	2	1	2	2	3	3	12
	Equinox	−15	−22	−26	−23	−16	−6	3	8	10	9	8	8	8	9	9	9	8	7	6	4	4	3	1	−4	36
	Summer	−31	−34	−31	−24	−13	−2	7	14	17	16	14	13	14	14	13	13	11	9	7	5	1	−5	−12	−19	51
	Year	−17	−21	−22	−18	−11	−3	4	8	10	9	8	7	8	8	8	8	7	6	5	3	2	0	−3	−7	32
Leningrad	Winter	0	1	2	4	4	3	0	−3	−6	−6	−5	−3	−1	0	1	1	3	3	4	5	4	4	2	1	11
	Equinox	5	6	6	6	5	1	−6	−15	−21	−21	−16	−10	−3	0	2	4	6	8	10	11	10	10	8	7	32
	Summer	7	8	9	6	0	−7	−18	−25	−31	−30	−24	−15	−5	4	8	9	10	15	15	14	13	11	8	8	46
	Year	4	5	6	5	3	−1	−8	−14	−19	−19	−15	−9	−3	1	4	5	6	9	10	10	9	8	6	5	29
Sverdlovsk	Winter	−2	0	1	1	1	−3	−6	−7	−5	−4	−1	0	0	0	1	1	2	3	4	4	4	3	2	2	11
	Equinox	3	4	5	3	−4	−12	−21	−23	−20	−14	−6	−1	2	3	4	5	7	9	10	10	10	9	9	9	33
	Summer	10	10	6	−2	−12	−20	−25	−25	−22	−16	−9	−2	5	7	7	8	9	10	11	11	10	9	9	11	36
	Year	4	5	4	1	−5	−12	−17	−18	−16	−11	−5	−1	2	3	4	5	6	7	8	8	8	7	7	7	26
Kazan'	Winter	−2	−2	0	1	2	1	−2	−5	−6	−5	−3	−1	0	1	1	1	2	2	3	4	3	3	2	1	10
	Equinox	3	4	5	5	2	−3	−12	−19	−22	−18	−12	−6	−1	1	3	4	6	8	9	9	9	9	9	8	31
	Summer	7	9	9	5	−4	−11	−18	−23	−23	−20	−15	−9	−1	4	6	7	8	10	11	11	9	9	9	9	34
	Year	3	4	5	4	0	−4	−11	−16	−17	−14	−10	−3	−1	2	3	4	5	7	8	8	7	7	7	6	25
Irkutsk	Winter	0	−2	−7	−11	−11	−8	−2	2	3	2	0	0	0	1	1	2	3	3	4	4	3	4	5	5	16
	Equinox	−2	−10	−21	−27	−27	−22	−9	1	7	7	5	4	5	6	7	8	8	9	9	8	8	8	9	9	36
	Summer	−7	−18	−26	−31	−29	−21	−11	0	7	10	10	8	7	8	8	9	10	10	9	8	8	11	12	8	43
	Year	−3	−10	−18	−23	−22	−17	−7	1	6	6	5	4	4	5	5	6	7	7	7	7	6	8	9	7	32
Vladivostok	Winter	−10	−17	−19	−14	−6	1	5	6	5	4	3	3	2	2	2	2	3	2	3	4	4	5	7	3	26
	Equinox	−25	−31	−27	−17	−5	4	9	9	6	4	4	4	5	6	6	7	7	6	6	6	6	8	5	−5	40
	Summer	−28	−28	−21	−12	−2	4	8	8	7	4	3	4	5	6	6	7	6	5	5	5	7	5	−2	−12	36
	Year	−21	−25	−22	−14	−4	3	7	8	6	4	4	3	4	4	5	5	6	5	5	5	5	7	6	−5	31
Tbilisi	Winter	−4	−3	−2	1	3	3	1	1	−1	0	1	1	0	−1	−1	−1	−1	0	1	1	1	1	0	0	7
	Equinox	−2	−1	0	1	1	−7	−12	−11	−7	−1	4	5	4	1	−1	−1	0	2	3	4	4	5	4	4	17
	Summer	0	2	4	2	−3	−11	−16	−14	−8	−1	4	6	5	1	−1	−1	0	3	5	5	5	5	5	4	22
	Year	−2	−1	1	1	0	−5	−9	−8	−5	−1	3	4	3	0	−1	−1	0	2	3	3	3	4	3	3	13
Tashkent	Winter	−3	−1	0	2	−1	−2	−3	−1	2	3	2	1	0	−1	−1	−1	−1	0	1	1	1	1	1	1	6
	Equinox	1	0	0	−4	−11	−15	−13	−6	1	5	6	4	2	0	0	1	2	3	4	4	4	4	4	5	21
	Summer	3	3	−1	−9	−15	−19	−14	−8	0	5	6	5	4	1	0	2	3	4	5	5	4	4	4	5	25
	Year	0	1	0	−4	−9	−12	−10	−5	1	4	5	3	2	0	0	1	1	2	3	3	3	3	3	4	17

POOR ORIGINAL

TABLE 19

SOLAR DAILY GEOMAGNETIC VARIATIONS OF VERTICAL COMPONENT FOR QUIET DAYS (GAMMAS)

AVERAGE FOR 11 YEARS

Observatory	World time	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23		Amplitude
Leningrad	Winter	−1	−1	0	0	−1	−1	−1	−2	−2	−2	−1	1	2	2	2	2	2	2	1	1	0	−1	−1	−1	4
	Equinox	−1	0	0	1	2	2	1	−2	−5	−6	−6	−3	1	3	3	3	2	2	2	1	1	0	−2	−1	9
	Summer	0	2	2	2	2	1	−1	−5	−7	−10	−8	−4	0	2	5	5	5	4	4	2	1	0	0	0	15
	Year	−1	0	1	1	1	1	0	−3	−5	−6	−5	−2	1	2	3	3	3	3	2	1	1	0	−1	−1	9
Sverdlovsk	Winter	0	0	1	1	1	0	−1	−2	−2	−2	0	1	1	1	1	1	1	1	1	0	−1	−1	−1	−1	3
	Equinox	1	1	3	4	4	1	−2	−6	−7	−6	−3	1	2	2	2	2	2	1	1	1	0	0	−1	−1	11
	Summer	3	3	3	2	0	−3	−7	−9	−9	−7	−3	1	4	4	4	3	2	2	2	1	1	1	1	1	13
	Year	1	1	2	2	2	−1	−3	−6	−6	−5	−2	1	2	2	2	3	2	1	1	1	0	0	0	0	9
Kazan'	Winter	−1	0	0	0	1	0	−2	−2	−3	−3	−1	1	1	2	2	2	2	2	2	1	0	0	−1	−1	5
	Equinox	0	1	2	3	3	2	−1	−5	−8	−8	−5	−1	1	2	2	2	2	2	2	2	1	0	0	[illegible]	11
	Summer	3	4	3	2	0	−1	−5	−7	−10	−10	−7	−2	2	4	4	3	3	2	2	2	1	1	[illegible]	1	14
	Year	1	2	2	2	1	0	−1	−4	−6	−7	−5	−2	0	2	3	3	2	2	2	2	1	0	0	0	10
Irkutsk	Winter	1	2	1	0	−1	−2	−1	0	0	0	0	0	0	0	0	1	0	0	0	0	−1	−1	−1	−1	4
	Equinox	4	3	1	−3	−6	−7	−6	−7	−1	1	2	1	1	1	2	1	2	1	1	1	0	0	0	1	11
	Summer	1	−1	−5	−8	−10	−9	−7	−4	−1	2	5	4	3	3	2	2	2	2	2	2	3	4	4	3	15
	Year	2	1	−1	−4	−6	−6	−5	−3	−1	1	2	2	1	1	1	1	1	1	1	1	1	1	1	1	8
Vladivostok	Winter	0	−2	−3	−4	3	−2	−2	−3	−3	−3	−1	1	2	2	[illegible]	3	4	3	3	2	1	0	1	0	8
	Equinox	−2	−6	−8	−8	−7	−5	−2	0	1	0	2	2	2	3	3	4	4	3	3	3	2	2	3	2	12
	Summer	−6	−8	−10	−9	−9	−7	−6	−1	1	2	2	2	3	3	3	3	3	3	6	6	7	7	6	0	17
	Year	3	−5	−7	−7	−6	−5	−3	−1	0	0	2	2	2	3	3	4	3	3	4	3	3	4	3	1	11
Tbilisi	Winter	0	0	0	0	0	1	−1	−3	−5	−5	−3	0	1	2	2	2	2	2	2	2	1	1	0	0	7
	Equinox	3	3	3	5	7	6	−2	−8	−13	−13	−11	−6	−1	1	2	2	3	3	3	3	2	3	2	1	20
	Summer	4	6	8	8	6	2	−4	−9	−12	−13	−12	−9	−6	0	3	3	2	3	3	4	1	4	3	3	21
	Year	2	3	4	4	4	3	−2	−7	−10	−10	−9	−6	−2	1	2	2	2	3	3	3	3	3	2	1	14
Tashkent	Winter	1	1	2	3	2	−1	−4	−5	−4	−2	−1	0	0	0	0	1	1	1	1	1	1	1	0	0	8
	Equinox	3	4	6	6	1	−5	−10	−11	−9	−5	−1	1	1	1	1	2	2	2	2	2	2	2	2	1	20
	Summer	7	8	7	4	−2	−8	−13	−12	−10	−7	−4	0	3	2	2	2	2	2	2	3	3	2	3	3	21
	Year	4	4	5	4	0	−5	−9	−9	−8	−5	−2	0	1	1	1	2	2	2	2	2	2	2	2	1	11

TABLE 20

SOLAR DAILY GEOMAGNETIC VARIATIONS OF DECLINATION (D) FOR QUIET DAYS (MINUTES)

YEARS OF LOW MAGNETIC ACTIVITY

Observatory and observation year	World time	1	2	3	4	5	6	7	8	9	10
Bukhta Tikhaya, 1944 [1]	Winter	18.6	21.6	19.2	21.5	5.4	−7.6	−12.2	−13.3	−9.9	−13.1
	Equinox	27.7	26.6	31.8	27.3	15.0	0.4	−6.2	−9.6	−12.0	−14.6
	Summer	40.5	49.6	46.8	31.0	16.7	7.9	0.2	−2.8	−8.8	−14.4
	Year	28.8	32.6	32.6	26.6	12.4	0.2	−6.1	−8.5	−10.2	−14.0
Mys Chelyuskin, 1944 [2]	Winter	11.8	0.1	−6.9	−10.8	−12.9	−13.8	−12.6	−12.8	−9.8	−11.3
	Equinox	19.9	10.7	6.4	2.1	−3.8	−9.2	−11.8	−16.2	−20.1	−19.4
	Summer	30.7	18.0	9.8	4.0	−2.9	−9.4	−16.1	−25.3	−27.1	−31.7
	Year	20.8	9.6	3.1	−1.6	−6.5	−10.8	−13.5	−18.1	−19.0	−20.8
Dikson, 1944 [3]	Winter	3.1	−0.4	−2.2	−2.5	−3.3	−3.3	−3.7	−5.0	−3.3	−2.9
	Equinox	3.8	1.3	2.6	3.7	3.1	1.3	1.4	−4.0	−6.8	−6.4
	Summer	8.2	6.7	8.4	9.2	6.7	5.4	2.9	−4.7	−7.6	−11.2
	Year	5.0	2.6	3.0	3.4	2.2	1.1	0.2	−4.6	−5.9	−6.8
Matochkin Shar, 1944 [4]	Winter	5.6	2.6	0.4	0.1	−1.5	−1.0	1.5	−2.1	−2.4	−2.5
	Equinox	5.9	2.0	2.6	2.5	2.2	1.9	1.5	−0.9	−3.1	−4.0
	Summer	9.0	7.2	5.9	6.4	5.6	5.9	3.3	0.1	−3.7	−6.5
	Year	6.8	3.9	3.0	3.0	2.1	2.3	1.1	−1.0	−3.0	−4.3
Tiksi, 1944 [5]	Winter	1.0	0.7	0.2	0.2	0.0	0.1	−0.7	−0.2	−0.4	−0.1
	Equinox	1.4	1.0	1.2	1.0	−0.1	−1.0	−1.4	−1.4	−1.0	−0.8
	Summer	2.4	0.4	2.3	−4.7	−6.2	−6.6	−6.9	−5.6	−4.6	−2.8
	Year	1.6	0.7	−0.3	−1.3	−2.2	−2.7	−3.2	−2.6	−2.1	−1.4
Uelen, 1943 [6]	Winter	−2.1	−1.8	−1.2	−1.4	−0.8	−0.3	−0.5	−0.5	−0.1	0.3
	Equinox	−3.4	−3.6	−3.5	−3.3	−2.6	−1.6	−1.1	−1.0	−0.6	−0.7
	Summer	−5.4	−6.2	−5.8	−5.4	−3.6	−2.4	−1.5	−0.4	−1.0	−0.9
	Year	−3.6	−3.9	−3.5	−3.4	−2.4	−1.4	−1.0	−0.6	−0.6	−0.4
Yakutsk, 1944 [7]	Winter	−0.4	−1.0	−1.3	−2.0	−1.9	−1.4	−0.5	0.0	0.1	0.1
	Equinox	1.1	−0.1	−1.8	−3.4	−4.6	−4.6	−3.4	−2.2	−1.3	−0.6
	Summer	1.2	−1.1	−3.6	−5.2	−6.3	−6.4	−5.5	−4.0	−2.6	−1.4
	Year	0.6	−0.7	−2.3	−3.6	−4.2	−4.1	−3.2	−2.1	−1.3	−0.6
Sverdlovsk, 1944 [8]	Winter	0.5	0.1	0.2	0.2	0.2	0.1	−0.8	−1.6	−1.9	−1.7
	Equinox	1.2	1.6	2.1	3.2	3.9	3.6	1.9	−0.6	−3.0	−4.3
	Summer	3.0	4.0	5.0	5.4	5.1	4.0	1.9	−0.8	−3.5	−5.6
	Year	1.6	1.9	2.4	2.9	3.1	2.5	1.0	−1.0	−2.8	−3.9
Kazan', 1944 [9]	Winter	0.6	0.3	0.2	0.2	0.3	0.3	−0.2	−0.8	−1.2	−1.6
	Equinox	0.8	1.0	1.3	1.9	3.0	3.2	2.7	1.3	−1.1	−3.0
	Summer	1.8	2.6	3.6	4.0	4.4	4.2	3.4	1.3	−1.7	−4.2
	Year	1.1	1.3	1.7	2.0	2.5	2.6	2.0	0.6	−1.3	−2.9
Irkutsk, 1944 [10]	Winter	0.0	0.4	0.4	0.0	−0.8	−1.4	−1.4	−0.9	−0.2	0.1
	Equinox	2.2	2.9	2.5	1.4	−0.4	−2.3	−3.5	−3.5	−2.7	−1.5
	Summer	5.0	4.6	3.3	1.1	−1.4	−3.5	−4.8	−5.0	−4.3	−3.0
	Year	2.4	2.7	2.1	0.8	−0.9	−2.4	−3.2	−3.2	−2.4	−1.5
Vladivostok, 1944 [11]	Winter	0.6	0.1	−0.9	−1.6	−1.6	−1.0	−0.1	0.0	0.1	0.1
	Equinox	1.8	0.7	−1.0	−2.3	−2.9	−2.6	−1.6	−0.5	0.0	0.0
	Summer	1.5	−0.1	−1.8	−3.2	−3.7	−3.5	−2.1	−1.4	−0.6	−0.1
	Year	1.3	0.2	−1.2	−2.4	2.7	−2.4	−1.5	−0.7	−0.2	−0.1
Tbilisi, 1944 [12]	Winter	0.4	0.2	0.2	0.2	0.2	0.5	0.6	0.0	−1.0	−1.4
	Equinox	0.6	0.6	0.7	1.3	2.5	3.2	2.5	0.8	−1.2	−2.5
	Summer	1.0	1.3	2.2	3.1	3.7	3.7	2.5	0.5	1.6	3.1
	Year	0.6	0.7	1.0	1.5	2.2	2.5	1.9	0.1	−1.3	−2.4
Tashkent, 1944 [13]	Winter	−0.2	−0.3	−0.2	0.2	0.5	0.1	−0.6	1.2	−1.1	−0.6
	Equinox	0.1	0.8	1.7	2.8	2.8	1.7	−0.2	2.0	−2.8	−2.6
	Summer	1.4	2.6	3.3	3.9	3.2	1.4	−0.7	2.4	−3.3	−3.5
	Year	0.6	1.0	1.6	2.3	2.2	1.1	0.5	−1.8	−2.4	−2.3

	11	12	13	14	15	16	17	18	19	20	21	22	23		Amplitude
[1]	-8.7	-5.8	-2.9	-0.8	0.6	-6.1	-7.7	-14.6	-7.4	-4.7	-2.4	7.0	11.6	10.8	36.2
	-17.4	-15.6	-9.6	-9.4	-10.2	-9.2	-11.5	-15.5	-11.4	-6.3	23.0	6.1	8.4	12.3	49.2
	-20.6	-21.0	-17.4	-18.4	-17.8	-17.7	-24.0	-28.0	-33.0	-21.8	-7.2	5.8	20.5	33.8	83.4
	-15.6	-14.1	-10.0	-9.5	-9.1	-11.0	-14.4	-19.4	-17.3	-10.9	-2.2	6.3	13.5	18.9	52.0
[2]	-10.2	-9.9	-7.6	0.6	1.6	-5.0	-2.4	5.8	5.2	10.2	27.6	22.0	21.8	19.4	41.4
	15.4	-14.6	-11.0	-10.8	-12.8	-3.5	-7.2	-0.2	7.4	13.9	18.9	24.1	28.1	23.5	42.2
	-30.7	-30.5	-29.2	-27.2	-29.2	-22.9	-16.2	-4.8	9.1	24.0	40.1	51.2	66.7	49.4	98.4
	-18.7	-18.3	-15.9	-12.5	-13.5	-10.5	-8.6	0.3	7.2	16.1	28.9	32.5	38.9	30.8	59.7
[3]	1.9	-2.6	-4.2	-4.4	-7.6	-8.3	-8.5	-1.8	4.0	9.5	16.6	14.0	10.0	8.4	25.1
	-6.2	-8.0	-6.6	-6.8	-8.4	-7.4	-7.6	0.4	4.9	9.0	11.3	11.3	7.5	6.8	19.7
	-13.3	-15.8	-16.6	-14.3	-15.8	-17.0	-12.8	-1.0	7.1	15.2	13.3	16.6	20.8	12.7	37.8
	-7.1	-8.8	-9.2	-8.5	-10.6	-10.9	-9.6	-1.8	5.4	11.2	13.8	14.0	12.8	9.3	21.9
[4]	-2.3	-2.4	-2.7	-3.1	-4.2	-4.2	-3.8	-1.3	-2.0	0.2	8.2	7.7	7.3	5.1	11.9
	-5.4	-6.1	1.9	-4.8	-5.0	-4.4	-5.8	-3.2	-1.0	2.8	6.4	7.6	7.1	5.8	13.4
	-9.3	-12.0	-11.5	-9.9	-9.9	-9.7	-7.9	-7.9	-2.4	4.0	5.3	12.2	15.5	10.5	27.5
	-5.6	-6.8	-6.4	-5.9	-6.4	-6.1	-5.8	-1.1	-1.8	2.3	6.6	9.2	10.0	7.1	16.8
[5]	0.0	0.4	-0.3	0.4	0.0	0.1	-0.2	0.1	-0.2	-0.7	-1.0	0.0	0.1	0.8	2.0
	-0.6	0.2	0.4	0.2	-0.2	-1.4	0.4	0.0	1.4	0.7	0.1	0.4	0.3	0.3	2.8
	-1.5	-0.2	-1.1	-0.2	-0.2	0.0	2.6	2.9	3.7	6.3	6.8	6.7	6.2	5.3	13.7
	-0.8	0.1	-0.3	0.1	-0.1	-0.5	1.0	1.1	1.8	2.4	2.2	2.3	2.4	2.2	5.6
[6]	-0.2	0.2	0.3	1.0	1.0	1.0	1.1	2.3	2.0	1.5	0.8	-0.3	1.0	-1.8	4.4
	-0.2	0.4	0.8	1.0	1.2	1.6	2.0	3.7	4.0	4.5	3.8	1.7	-0.4	-3.0	8.1
	-1.2	-1.4	-0.8	0.3	1.4	3.2	4.8	6.4	7.0	6.6	5.2	2.9	0.1	-2.4	13.2
	-0.5	-0.2	0.1	0.8	1.2	1.9	2.8	4.1	4.3	4.2	3.3	1.4	-0.4	-2.4	8.2
[7]	0.2	0.0	0.2	1.0	0.9	0.7	0.9	0.8	0.8	0.9	0.5	0.6	0.7	0.6	3.0
	0.0	0.0	0.2	0.6	0.9	1.8	2.1	1.8	1.8	1.8	2.0	2.2	2.6	2.6	7.2
	-0.6	0.1	0.2	0.2	0.1	1.2	1.6	2.5	3.3	4.1	5.3	6.4	5.8	4.0	12.8
	-0.1	0.0	0.2	0.6	0.7	1.3	1.5	1.7	2.0	2.4	2.6	3.0	3.0	2.4	7.2
[8]	-1.0	-0.4	-0.1	0.1	0.1	0.0	0.2	0.6	0.8	0.8	1.1	1.0	0.9	0.8	3.0
	-4.3	-3.2	-1.8	-1.0	-0.8	-0.6	-0.6	-0.2	0.0	0.3	0.3	0.6	0.6	0.8	8.2
	-5.2	-5.6	-4.0	-2.1	-1.4	-1.2	-0.9	-0.9	-0.6	-0.1	0.5	0.8	1.3	2.2	11.6
	-3.8	-3.1	-2.0	-1.1	-0.7	-0.6	-0.1	-0.2	0.1	0.3	0.6	0.8	0.9	1.3	7.0
[9]	-1.4	-0.8	0.4	-0.2	-0.2	-0.2	0.0	0.4	0.6	0.8	1.0	0.8	0.8	0.8	2.6
	-3.8	-3.5	-2.4	-1.3	-0.8	-0.6	0.6	0.3	0.1	0.2	0.3	0.4	0.6	0.6	7.0
	-5.3	-5.3	-4.4	-2.9	-2.0	-1.2	-0.8	-0.6	-0.5	-0.3	0.2	0.6	1.0	1.6	9.7
	-3.5	-3.2	-2.4	-1.5	-1.0	-0.7	-0.4	-0.2	0.0	0.2	0.5	0.6	0.8	1.0	6.1
[10]	0.2	0.2	0.3	0.5	0.4	0.3	0.4	0.4	0.1	0.1	0.2	0.2	0.1	0.0	1.9
	-0.6	-0.4	-0.3	-0.2	-0.2	0.3	0.1	0.5	0.6	0.8	0.8	0.9	1.0	1.4	6.1
	-1.7	-0.7	-0.6	-0.8	-0.8	-0.5	-0.2	0.3	0.7	1.1	1.4	2.3	3.4	4.4	10.0
	-0.7	-0.3	-0.2	-0.1	-0.2	0.0	0.2	0.1	0.6	0.8	0.8	1.1	1.5	2.0	5.9
[11]	0.1	0.2	0.1	0.3	0.2	0.2	0.3	0.3	0.3	0.4	0.2	0.2	0.4	0.9	2.5
	0.1	0.2	0.0	0.1	0.1	0.1	0.6	0.6	0.6	0.6	0.7	0.8	1.4	2.0	1.9
	-0.3	-0.3	-0.2	-0.2	0.0	0.3	0.8	1.0	1.3	1.6	2.0	3.1	3.5	3.0	7.2
	0.0	0.0	0.0	0.1	0.1	0.3	0.6	0.6	0.7	0.8	1.0	1.4	1.8	2.0	4.7
[12]	-1.3	-0.7	-0.3	-0.1	0.0	0.0	0.0	0.1	0.2	0.3	0.6	0.4	0.4	0.4	2.0
	-2.9	-2.5	-1.6	-0.8	-0.6	-0.4	-0.4	-0.2	0.0	0.2	0.3	0.1	0.4	0.4	6.1
	-3.9	-3.8	-2.9	1.9	1.1	0.6	-0.6	-0.4	-0.2	0.1	0.4	0.6	0.8	1.0	7.6
	-2.7	-2.3	-1.6	-0.9	-0.6	-0.4	-0.4	-0.2	0.0	0.2	0.4	0.5	0.6	0.6	5.1
[13]	0.0	0.2	0.2	0.2	0.2	0.1	0.2	0.3	0.1	0.1	0.1	0.2	0.2	0.1	1.7
	-1.8	-0.9	-0.4	-0.3	-0.4	-0.3	-0.2	0.0	0.2	0.2	0.3	0.3	0.3	0.3	5.5
	-3.1	-2.3	-1.3	-0.8	0.7	-0.7	-0.4	-0.2	0.0	0.2	0.4	0.6	0.7	1.0	7.4
	-1.7	-1.0	-0.5	-0.3	-0.3	-0.3	-0.2	0.0	0.2	0.3	0.4	0.4	0.4	0.5	4.7

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TABLE 21

SOLAR DAILY GEOMAGNETIC VARIATIONS OF DECLINATION (D) FOR QUIET DAYS

(MINUTES) YEARS OF HIGH MAGNETIC ACTIVITY

Observatory and Yr	Time	1	2	3	4	5	6	7	8	9	10
Bukhta Tikhaya 1937 [1]	Winter	11.4	14.2	12.7	13.2	8.8	2.7	−4.1	−7.5	−4.5	−5.6
	Equinox	23.8	20.3	27.3	20.6	12.8	5.4	3.2	−1.8	6.2	−10.0
	Summer	42.6	59.0	55.8	47.8	32.3	18.3	5.6	−6.7	−15.3	−19.7
	Year	25.9	31.1	31.9	27.2	17.9	8.8	1.6	5.4	8.7	11.8
Dikson, 1937 [2]	Winter	3.3	0.7	0.7	0.9	0.7	0.6	−1.1	−3.3	−4.7	−3.4
	Equinox	6.6	7.9	6.8	6.6	5.6	3.8	0.8	−2.3	−5.6	−7.7
	Summer	19.1	17.1	15.7	14.4	9.8	3.2	−3.2	9.4	−13.8	−13.9
	Year	9.7	8.6	7.7	7.3	5.3	2.6	1.2	5.0	−8.0	−8.3
Matochkin Shar, 1937 [3]	Winter	5.0	1.3	0.6	1.2	0.3	0.6	0.0	−1.0	2.8	2.2
	Equinox	7.4	3.1	3.1	3.9	3.9	4.1	3.0	1.6	1.0	5.0
	Summer	14.0	11.4	10.8	12.1	11.0	8.2	4.5	0.6	−4.7	−7.2
	Year	8.8	5.3	4.8	5.7	5.0	4.3	2.5	0.4	−2.9	1.1
Tiksi, 1947 [4]	Winter	1.6	1.2	0.1	−1.2	−2.6	−4.4	4.4	−3.1	1.9	−1.6
	Equinox	6.1	2.2	−1.0	−4.7	−10.0	−11.7	−11.4	−9.0	−6.3	−5.4
	Summer	7.8	1.1	−6.6	−13.3	16.3	−15.6	−15.4	13.1	−8.4	−4.2
	Year	5.2	1.5	−2.5	−6.4	9.6	10.6	−10.4	8.4	5.5	−3.7
Uelen, 1937 [5]	Winter	1.3	1.8	1.6	−1.4	−1.0	−1.0	−0.5	0.8	−0.3	0.6
	Equinox	2.4	−3.2	−3.8	3.7	−3.4	2.2	−1.6	1.3	−1.0	−1.1
	Summer	−6.6	−7.2	−7.3	−6.1	−4.4	2.2	1.0	0.7	−0.2	−0.3
	Year	−3.3	−4.0	−4.2	3.7	−2.9	−1.8	−1.0	−0.9	−0.5	0.3
Srednikan, 1948 [6]	Winter	−0.5	−1.4	−2.1	2.7	2.6	−1.8	0.9	0.7	0.8	−0.5
	Equinox	−0.2	−1.8	−1.3	−6.0	6.0	−5.0	−3.4	−1.8	−0.0	0.2
	Summer	−2.6	−5.0	−7.6	8.7	−8.5	7.0	−4.1	−1.8	−0.2	0.5
	Year	1.1	2.7	−4.6	−5.8	−5.7	4.6	−2.9	1.4	−0.3	0.0
Yakutsk, 1948 [7]	Winter	0.8	0.0	1.0	2.0	−.6	2.8	−1.9	1.1	−0.9	0.8
	Equinox	2.7	1.2	1.0	3.6	6.0	6.4	6.0	−4.6	−2.2	0.7
	Summer	3.8	0.0	1.0	−7.3	9.6	−10.4	−8.9	−6.4	−3.4	−1.0
	Year	2.4	0.4	2.0	−4.3	6.1	−6.5	−5.6	4.0	−2.2	0.9
Leningrad, 1948 [8]	Winter	1.0	0.9	0.8	0.6	0.8	1.2	1.9	2.0	1.3	−0.1
	Equinox	0.8	1.3	1.4	1.7	2.6	4.3	5.6	5.5	3.4	0.1
	Summer	2.0	2.9	1.3	6.1	7.5	8.0	7.4	5.5	2.2	1.9
	Year	1.2	1.7	2.2	2.8	3.6	1.5	5.0	4.3	2.3	−0.6
Sverdlovsk, 1948 [9]	Winter	0.6	0.8	0.6	0.9	1.7	2.0	1.2	0.0	−1.2	−2.0
	Equinox	1.0	1.8	3.0	4.7	5.8	6.0	4.3	0.8	−2.9	−5.5
	Summer	3.9	5.7	7.5	8.7	8.6	7.0	3.7	1.0	−5.1	−7.8
	Year	1.8	2.8	3.7	4.8	5.4	5.0	3.1	0.0	−3.0	5.1
Kazan', 1948 [10]	Winter	0.6	0.3	0.4	0.5	1.2	1.7	2.0	1.0	−0.2	−1.3
	Equinox	1.0	1.4	1.8	2.9	4.5	5.7	5.2	3.1	−0.4	−3.6
	Summer	2.3	3.7	5.4	6.9	7.5	6.9	5.2	2.0	−2.3	−5.7
	Year	1.3	1.8	2.5	3.4	4.4	4.8	4.1	2.0	1.0	−3.5
Moscow, 1948 [11]	Winter	0.7	0.6	0.5	0.5	0.8	1.5	2.1	1.8	0.7	−0.6
	Equinox	0.8	1.3	1.4	2.0	3.2	5.1	5.7	4.7	1.8	−1.7
	Summer	1.8	2.6	4.2	6.0	7.2	7.4	6.5	4.0	0.2	−4.0
	Year	1.1	1.5	2.0	2.8	3.8	4.7	4.8	3.5	0.9	−2.1
Irkutsk, 1948 [12]	Winter	0.5	1.3	1.9	1.3	0.2	−0.9	1.6	−2.0	−1.6	−0.8
	Equinox	3.5	4.8	5.1	3.9	1.1	−2.0	4.5	−5.6	−4.7	−2.8
	Summer	7.8	7.5	5.8	2.8	1.0	−4.5	7.0	−8.0	−7.2	−5.2
	Year	3.9	4.6	4.2	2.6	0.1	−2.5	−4.4	[illegible]	−4.5	−3.0
Odessa, 1948 [13]	Winter	0.7	0.5	0.3	0.2	0.5	0.9	1.5	2.1	1.2	−0.4
	Equinox	0.7	0.8	0.9	1.1	2.0	3.7	4.8	4.6	2.4	−0.8
	Summer	0.8	1.2	1.8	3.4	4.8	5.3	5.0	4.4	0.8	2.4
	Year	0.8	0.8	1.0	1.6	2.4	3.3	3.9	3.4	1.5	−1.2

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	11	12	13	14	15	16	17	18	19	20	21	22	23		Amplitude
[1]	−7.4	−9.2	−2.0	−3.4	−5.2	−4.6	−8.7	−9.2	−5.4	−4.6	1.2	3.3	5.2	8.5	23.4
	−14.7	−16.8	−11.4	−11.1	−8.4	−8.3	−9.4	−10.6	−11.9	−5.3	−2.5	2.4	0.8	6.1	44.1
	−25.8	−28.8	−23.8	−25.0	−21.0	−16.9	−19.7	−26.2	−33.2	−23.9	−13.6	−5.2	12.9	30.4	92.2
	−16.0	−18.3	−12.4	−13.2	−11.5	−9.9	−12.6	−15.3	−16.8	−11.3	−5.0	0.2	8.3	15.0	50.2
[2]	−2.4	−4.0	−3.9	−5.1	−2.7	−2.6	−3.2	0.5	3.6	9.1	5.6	4.3	3.4	3.0	14.2
	9.9	−10.4	−7.7	−7.2	−6.3	−5.9	−4.4	−1.7	0.6	3.1	3.8	7.4	7.8	8.6	19.0
	−14.4	−13.6	− 12.0	−11.7	10.2	−10.5	−10.7	−8.0	−3.2	1.3	8.0	15.7	14.2	16.5	33.5
	− 8.9	−9.3	− 7.9	−8.0	−6.4	−6.3	6.1	−3.0	0.3	4.5	5.8	9.1	8.1	9.4	19.0
[3]	−1.7	−4.0	−2.9	−3.3	−2.1	−2.0	−3.5	−1.2	1.4	1.6	1.4	3.6	3.8	3.6	8.5
	−6.1	−6.4	−6.2	−5.4	−4.6	−4.5	−4.3	−3.6	−1.6	0.6	1.5	3.9	5.7	7.8	13.8
	−10.4	−12.0	−10.6	−10.3	−7.5	−8.3	−8.5	−8.4	−6.5	−4.4	0.1	7.4	7.4	10.8	26.0
	−6.1	−7.4	−6.5	−6.1	−1.8	−1.9	−5.4	−4.1	−2.2	−0.7	1.1	5.0	5.6	7.4	16.2
[4]	−1.2	−0.5	−0.1	−0.7	−0.6	0.4	1.0	1.4	1.9	2.2	2.8	3.1	3.3	2.9	7.7
	2.7	0.0	1.9	0.8	1.2	−0.3	0.7	2.2	4.9	5.9	8.4	9.2	9.3	9.4	21.1
	−1.1	−0.2	−0.2	−0.5	−1.5	0.6	0.2	3.1	7.7	11.8	16.0	16.5	17.8	16.0	34.1
	−1.8	− 0.2	0.6	−0.1	−0.3	−0.2	0.6	2.2	4.8	6.6	9.1	9.6	10.1	9.4	20.7
[5]	0.6	−0.4	0.3	1.1	−0.2	0.0	1.0	1.3	1.4	1.8	1.8	1.2	0.4	−0.5	3.6
	−1.2	−0.2	0.7	1.0	0.8	1.3	2.2	3.2	4.3	4.4	4.0	2.9	1.1	−0.6	8.2
	−1.4	−1.6	−1.5	−0.6	0.6	3.0	5.8	7.6	8.9	8.9	7.0	3.4	−0.5	−4.0	16.2
	−1.0	−0.8	−0.2	0.5	0.4	1.4	3.0	4.0	4.9	5.0	4.3	2.5	0.3	−1.7	9.2
[6]	−0.3	0.0	0.6	0.8	1.0	1.2	1.1	1.4	1.2	1.4	1.3	1.4	1.7	1.6	4.4
	−0.3	−0.1	0.4	0.8	1.2	1.4	1.7	1.9	2.8	3.3	4.2	4.2	3.8	2.6	10.2
	0.4	0.6	0.2	0.5	0.7	1.4	2.5	3.9	5.6	7.4	8.0	7.2	4.8	1.9	16.7
	−0.1	0.2	0.4	0.7	1.0	1.3	1.8	2.4	3.2	4.1	4.5	4.3	3.4	2.0	10.3
[7]	0.7	−0.3	0.2	0.8	1.0	1.1	1.3	1.5	1.2	1.4	0.8	1.1	1.4	1.9	4.7
	−0.5	−0.3	0.4	0.8	0.9	1.2	1.7	1.9	2.4	2.5	3.2	3.6	4.4	4.6	11.0
	0.3	0.8	0.6	0.5	0.3	0.6	1.2	2.2	3.6	5.6	7.4	8.5	7.7	7.2	18.7
	−0.3	0.1	0.4	0.7	0.7	1.0	1.4	1.9	2.4	[illegible]	3.8	4.1	4.5	4.6	11.1
[8]	−1.6	−2.8	−3.2	−2.4	1.5	1.2	−1.0	0.8	0.1	0.1	0.9	1.1	0.9	0.3	5.2
	−3.1	−5.5	−6.0	−4.5	3.0	−1.9	−1.4	−1.2	0.6	0.6	−0.3	0.3	0.8	−0.1	11.6
	−6.1	−8.4	−8.2	−6.2	−1.2	2.4	−1.6	−1.8	−1.8	−1.7	−1.5	−1.1	0.0	0.9	16.4
	3.7	−5.5	−5.8	−1.4	−2.9	−1.8	−1.3	−1.2	−0.8	−0.6	−0.3	0.1	0.5	0.4	10.8
[9]	−2.3	−1.8	−1.2	−0.9	0.5	0.1	−0.2	0.2	0.6	0.5	0.5	0.5	0.2	0.1	1.3
	−6.1	5.0	−3.2	1.1	−1.2	1.1	−0.9	0.6	0.0	0.0	0.1	0.2	0.5	0.0	12.1
	−8.5	−7.7	−5.6	−3.0	−1.6	1.2	−1.6	−1.8	1.5	1.0	−0.4	0.1	0.7	2.0	17.2
	−5.6	−4.8	3.1	−1.8	1.1	0.9	9.9	−0.7	−0.3	−0.2	0.1	0.3	0.5	0.6	11.0
[10]	−2.1	−2.2	− 1.8	−1.2	−0.7	−0.7	−0.4	0.0	0.6	0.6	0.6	0.6	0.4	− 0.1	4.2
	−5.5	−5.5	−4.2	−2.5	−1.5	1.2	−1.0	−0.7	0.2	0.2	0.0	0.3	0.4	−0.1	11.2
	−7.5	− 7.5	−6.2	−3.8	1.9	1.0	−1.2	−1.5	−1.3	0.9	−0.5	−0.2	0.5	1.3	15.0
	−5.0	−5.1	−1.1	2.5	1.4	−1.0	−0.9	−0.7	−0.3	−0.2	0.0	0.3	0.1	0.1	9.9
[11]	−2.0	−2.7	−2.5	−1.8	−1.0	−0.8	−0.7	−0.3	0.4	0.6	0.8	0.9	0.6	0.0	4.8
	−4.6	−5.8	−5.4	−3.1	2.0	−1.4	−1.1	0.8	0.3	0.2	0.0	0.4	0.6	−0.2	11.5
	−7.2	−8.2	7.3	−5.0	−2.8	−1.2	1.0	1.2	−1.2	−1.0	−0.8	−0.5	0.4	0.9	15.6
	−1.6	−5.5	−5.0	−3.4	−1.9	−1.2	−0.9	−0.8	−0.4	−0.2	0.0	0.3	0.5	0.3	10.3
[12]	−0.7	−0.5	−0.1	0.0	0.3	0.1	0.1	0.6	0.5	0.1	0.4	0.2	0.0	0.0	3.9
	−1.5	−1.0	−0.7	−0.5	−0.6	−0.4	−0.2	0.2	0.6	0.5	0.7	0.8	1.0	1.9	10.7
	−2.8	−0.8	−0.4	−0.5	−0.8	0.8	0.6	−0.2	0.3	0.9	1.6	2.7	1.2	6.4	15.8
	−1.7	0.8	−0.5	−0.3	−0.4	−0.2	−0.1	0.2	0.5	0.7	0.9	1.2	1.8	2.8	9.8
[13]	−1.7	−2.1	−2.3	−1.9	1.2	−0.9	−0.6	−0.2	0.2	0.5	0.6	0.8	0.5	0.1	4.5
	−3.5	−1.8	−1.6	−3.5	2.2	−1.1	−1.1	−0.6	−0.2	−0.1	0.2	0.4	0.7	0.4	9.6
	1.6	5.7	5.3	−4.0	−2.1	−1.0	−0.4	−0.6	−0.4	−0.4	−0.2	−0.2	0.1	0.5	11.0
	−3.3	−1.3	−1.1	−3.1	−2.0	−1.1	−0.7	0.5	−0.2	0.0	0.2	0.3	0.5	0.4	8.2

		1	2	3	4	5	6	7	8	9	10
Vladivostok, 1947 [14]	Winter	3.0	2.6	0.9	−1.1	−2.1	−2.4	−1.8	−1.0	−0.6	−0.6
	Equinox	4.3	3.0	0.4	−2.2	−4.0	−4.2	−3.5	−2.2	−1.2	−1.0
	Summer	4.0	1.2	−1.8	−4.0	−5.4	−5.6	−4.5	−3.0	−1.4	−0.3
	Year	3.9	2.2	−0.3	−2.6	−4.0	−4.2	−3.4	−2.1	−1.1	−0.6
Tbilisi, 1948 [15]	Winter	0.5	0.3	0.2	0.2	0.6	1.4	1.9	1.2	−0.2	−1.4
	Equinox	0.7	0.8	0.9	1.7	3.4	4.6	4.0	2.2	−0.8	−2.9
	Summer	1.2	1.7	3.2	5.0	5.7	5.4	3.3	0.7	−2.4	−4.4
	Year	0.8	0.9	1.4	2.3	3.2	3.8	3.1	1.4	−1.1	−2.9
Tashkent, 1948 [16]	Winter	0.1	0.0	0.2	0.9	1.7	1.5	0.6	−0.6	−1.4	−1.2
	Equinox	0.6	1.3	2.7	4.2	4.4	3.0	0.5	−2.0	−3.8	−4.2
	Summer	2.3	4.3	5.7	6.1	5.0	2.3	−0.4	−3.3	−5.1	−5.6
	Year	1.0	1.9	2.9	3.7	3.7	2.3	0.2	−2.0	−3.4	−3.6

	11	12	13	14	15	16	17	18	19	20	21	22	23		Amplitude
[14]	−0.6	−0.5	−0.5	−0.3	−0.1	0.0	0.2	0.4	0.4	0.4	0.4	0.3	0.8	2.3	5.4
	−0.9	−0.8	−0.4	−0.2	0.0	0.3	0.6	0.8	0.9	1.0	1.2	1.6	2.6	4.1	8.5
	0.0	−0.3	−0.4	−0.4	−0.2	−0.1	0.3	0.6	1.0	1.4	2.6	4.4	5.6	6.0	11.6
	−0.5	−0.5	−0.4	−0.3	−0.1	0.1	0.4	0.6	0.8	0.9	1.5	2.3	3.2	4.3	8.5
[15]	−1.8	−1.6	−1.3	−1.0	−0.6	−0.4	−0.3	0.0	0.4	0.4	0.6	0.6	0.4	0.2	3.7
	−4.3	−4.2	−3.1	−1.8	−1.2	−1.0	−0.8	−0.4	0.0	0.1	0.2	0.4	0.6	0.3	8.9
	−5.5	−5.4	−4.4	−2.7	−1.0	−0.3	−0.6	−0.6	−0.4	−0.2	0.1	0.3	0.5	0.8	11.2
	−3.9	−3.8	−3.0	−1.8	−0.9	0.6	−0.5	−0.3	0.0	0.1	0.3	0.4	0.5	0.5	7.7
[16]	−1.0	−0.8	−0.7	−0.4	−0.2	−0.2	0.0	0.2	0.3	0.3	0.2	0.2	0.1	−0.2	3.1
	−3.4	−1.8	−0.9	−0.6	−0.7	0.5	−0.3	0.0	0.2	0.4	0.4	0.4	0.4	0.2	8.6
	−5.0	−3.6	−1.8	−0.6	−0.4	−0.6	−0.7	−0.5	−0.3	0.1	0.3	0.4	0.6	1.2	11.7
	−3.2	−2.1	−1.1	−0.5	−0.4	−0.4	−0.3	−0.1	0.1	0.3	0.3	0.4	0.4	0.4	7.3

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TABLE 22

SOLAR DAILY GEOMAGNETIC VARIATIONS OF HORIZONTAL COMPONENT (H) FOR QUIET DAYS (GAMMAS). YEARS OF LOW MAGNETIC ACTIVITY

Observatory and observation year	World time	1	2	3	4	5	6	7	8		9	10
Bukhta Takhaya, 1944 [1]	Winter	−14	−16	−21	−25	−13	5	13	18	18	28	28
	Equinox	−20	−20	−30	−30	−19	−5	3	11	17	25	23
	Summer	−20	−31	−40	−28	−19	−14	−9	−2	1	17	30
	Year	−18	−23	−31	−28	−17	−4	2	9	12	23	27
Mys Chelyuskin, 1944 [2]	Winter	−12	0	5	6	7	9	13	15	15	21	24
	Equinox	−12	−5	−6	−8	−11	−7	−2	5	14	22	23
	Summer	−12	−12	−10	−13	−16	−12	−10	0	6	18	33
	Year	−12	−6	−4	−5	−7	−3	0	7	11	20	27
Dikson, 1944 [3]	Winter	0	2	6	1	0	−1	0	2	0	3	5
	Equinox	6	11	6	2	−5	9	−11	8	−4	−3	2
	Summer	12	8	2	−4	−9	−13	−18	−11	−11	−5	2
	Year	6	7	5	0	−5	−8	−10	7	−5	−2	3
Matochkin Shar, 1944 [4]	Winter	−12	−1	2	4	3	1	0	0	−2	1	3
	Equinox	−7	7	9	7	6	1	−5	−7	−9	−10	−6
	Summer	2	8	13	10	1	−1	−12	−14	16	−14	−11
	Year	−6	4	8	7	4	1	−6	−7	−9	8	−5
Tiksi, 1944 [5]	Winter	−3	−2	1	0	1	2	4	5	4	4	3
	Equinox	−4	−4	−11	−12	−10	6	1	8	11	10	10
	Summer	−23	−24	−24	−20	−13	−6	1	8	12	15	18
	Year	−10	−11	−13	−11	−8	−3	2	7	10	10	11
Uelen, 1943 [6]	Winter	0	0	2	4	1	3	1	2	−1	0	1
	Equinox	−12	−9	−5	1	4	4	6	5	6	8	8
	Summer	−19	−15	−7	4	0	6	6	8	9	10	[illegible]
	Year	−11	−8	−3	1	3	4	4	5	5	6	7
Yakutsk, 1944 [7]	Winter	−4	−4	−4	−2	1	4	5	6	3	1	−1
	Equinox	−10	−12	−16	−11	−9	0	4	6	7	4	4
	Summer	−24	−27	−25	−18	−9	1	7	12	13	13	11
	Year	−13	−14	−15	−12	−6	1	5	8	8	6	5
Sverdlovsk, 1944 [8]	Winter	−4	−3	−2	−1	−2	−3	−3	−3	0	1	3
	Equinox	3	1	4	1	−3	−10	−16	16	−14	−10	−4
	Summer	7	7	5	−2	−10	−18	−22	−20	−16	−11	−6
	Year	2	3	2	−1	−5	−10	−14	−13	−10	−7	−2
Kazan', 1944 [9]	Winter	−4	−4	−3	−2	1	−1	−2	−2	−2	0	2
	Equinox	3	3	3	2	0	−3	−8	−13	14	−12	−8
	Summer	5	6	6	4	−5	−10	−16	−16	−17	−14	−10
	Year	1	2	2	2	−2	−5	−8	11	−11	−9	−5
Irkutsk, 1944 [10]	Winter	0	−2	−6	−8	−8	−4	2	6	6	2	1
	Equinox	2	−8	−16	−22	−21	−14	−5	2	6	4	2
	Summer	−6	−15	−20	−24	−23	−17	−8	2	6	8	6
	Year	−3	−8	−14	−18	−17	−11	−4	3	6	5	3
Vladivostok, 1944 [11]	Winter	−8	−14	−15	−10	3	2	6	7	6	4	3
	Equinox	−18	−23	−21	−12	−2	6	8	8	4	1	1
	Summer	−24	−24	−16	−8	0	5	8	9	6	3	2
	Year	−17	−20	−17	−10	−2	4	8	8	5	3	2
Tbilisi, 1944 [12]	Winter	−4	−3	−2	0	2	2	0	−2	−1	0	2
	Equinox	−1	−1	0	0	−5	−9	−12	−8	−2	3	6
	Summer	0	2	4	2	−4	−10	−14	−12	−7	0	3
	Year	−2	−1	0	1	−3	−6	−8	−7	−3	1	3
Tashkent, 1944 [13]	Winter	−2	−1	0	1	−2	−4	−4	−1	3	4	4
	Equinox	1	2	1	−4	−10	−13	−10	−1	2	4	4
	Summer	2	3	0	−9	−17	−18	−14	−6	1	5	5
	Year	0	1	0	−4	−9	−12	−10	−4	2	4	4

	11	12	13	14	15	16	17	18	19	20	21	22	23	Amplitude
[1]	17	8	−5	−10	−6	−6	−5	−5	4	4	−4	−1	4	53
	20	13	8	3	−9	0	2	6	1	4	1	−2	6	55
	32	29	30	18	3	−10	3	7	14	6	2	−2	11	72
	23	17	11	4	−4	−5	0	3	8	5	0	−2	−7	58
[2]	28	22	3	−13	−11	−17	−20	15	−6	−22	20	18	−15	50
	28	23	12	5	−18	−5	−9	−2	−4	−8	−12	−16	−10	44
	45	46	41	31	4	−8	−11	−9	−9	−21	−24	−31	−18	80
	34	31	19	−8	−8	−10	−13	−9	6	−18	−19	−22	−14	56
[3]	5	9	17	26	23	17	−2	−13	−18	−37	−26	−15	−6	63
	6	8	13	18	18	15	1	−8	−20	−18	−16	−6	1	38
	15	24	27	31	30	11	−2	20	30	−18	−12	−14	5	61
	9	14	19	25	24	14	0	−14	23	24	−18	−12	0	49
[4]	4	6	12	21	21	25	20	4	8	34	−30	−23	−12	59
	0	4	10	15	22	20	13	1	−10	−22	−20	−14	6	44
	1	13	20	27	31	34	24	6	−21	−22	−28	−33	−14	67
	1	7	14	21	21	26	19	4	−13	−26	−26	−23	10	52
[5]	3	3	5	5	0	−3	−8	8	3	4	−2	−2	1	13
	11	11	10	7	−2	1	6	1	−6	−2	−3	−2	4	23
	21	24	22	19	13	1	−1	−1	−3	4	9	−14	16	48
	12	13	15	11	4	0	−4	−4	1	−4	5	−6	−7	26
[6]	−2	−3	−2	−2	−3	−3	−2	−2	0	0	2	2	0	7
	5	0	3	2	−4	−6	2	1	0	−2	−6	−11	−12	21
	10	0	5	7	6	4	3	0	−4	8	−10	−11	−19	30
	5	5	2	2	0	−2	1	−1	−1	−3	−5	−7	−10	18
[7]	0	−2	−1	0	0	−1	−1	−2	2	1	0	0	2	10
	4	5	6	7	6	4	4	3	2	0	0	−2	−6	23
	10	10	12	11	10	8	6	6	1	1	−5	−11	−15	40
	5	7	5	6	[illegible]	4	3	2	1	0	−2	−4	−6	23
[8]	2	1	0	1	0	1	1	2	1	2	1	0	0	7
	−1	1	2	3	3	6	6	7	8	8	7	8	6	24
	−2	2	3	[illegible]	1	6	7	11	11	11	9	8	10	33
	0	2	2	2	3	4	5	7	7	7	6	6	5	21
[9]	2	4	3	2	2	2	2	1	0	2	0	−1	−2	48
	5	1	1	2	2	4	[illegible]	6	6	6	6	6	5	20
	−6	−2	2	2	1	1	6	9	10	9	8	8	7	27
	−3	0	2	2	2	3	4	6	6	6	5	4	3	17
[10]	0	−1	0	1	0	0	0	0	0	1	2	2	3	13
	2	3	4	4	6	6	6	7	6	6	7	8	7	30
	5	5	6	7	7	8	8	9	8	7	8	8	5	3
	2	2	3	4	4	5	5	5	5	5	5	6	5	21
[11]	2	1	1	2	2	1	1	0	1	2	1	4	1	22
	2	2	3	3	5	5	4	4	4	4	5	4	−5	31
	4	4	5	5	6	5	4	4	6	6	2	−4	−12	33
	2	2	3	4	4	3	3	3	4	4	4	1	−5	28
[12]	2	2	1	1	0	0	1	0	0	1	1	1	0	6
	7	4	0	0	−1	2	2	3	3	3	4	3	3	19
	5	3	0	−2	−2	0	2	6	6	6	5	6	4	20
	5	3	0	0	−1	0	1	3	3	3	3	3	2	13
[13]	3	2	0	1	0	0	0	0	0	1	1	1	1	8
	2	1	0	0	1	2	2	2	3	3	3	4	4	17
	3	2	0	0	2	5	4	5	6	6	5	5	6	24
	3	1	0	0	1	2	2	2	3	3	3	3	3	16

TABLE 23

SOLAR DAILY GEOMAGNETIC VARIATIONS OF HORIZONTAL COMPONENT (H) FOR QUIET DAYS (GAMMAS) YEARS OF HIGH MAGNETIC ACTIVITY

Observatory and observation year	World time	1	2	3	4	5	6	7	8	9	10	
Bukhta Tikhaya, 1937 [1]	Winter	8	11	−11	13	−12	[illegible]	7	13	15	16	15
	Equinox	−14	−13	−20	−20	14	7	−6	−3	−1	8	12
	Summer	−25	−36	13	−13	−41	28	−15	14	28	31	30
	Year	−16	−20	−25	−25	23	13	—	8	11	18	19
Dikson, 1937 [2]	Winter	−2	5	1	1	−1	−4	−1	−4	0	−1	0
	Equinox	2	8	9	5	−2	10	−13	−15	−12	−12	4
	Summer	11	4	1	10	−19	22	−16	−22	15	−10	1
	Year	4	6	5	2	−7	−12	−11	−14	−9	−5	1
Matochkin Shar, 1937 [3]	Winter	−8	0	1	[illegible]	1	2	1	−2	1	−2	−1
	Equinox	−7	6	13	12	10	3	−4	−11	−14	−13	−9
	Summer	−3	5	11	7	3	−11	−11	−22	−22	−21	−13
	Year	−6	4	9	8	4	−2	−6	−12	−12	−12	−9
Tiksi, 1947 [4]	Winter	4	−1	1	7	−5	2	1	3	4	6	6
	Equinox	−6	−11	−18	20	18	12	−1	10	15	16	20
	Summer	−31	−31	34	−32	21	−6	7	16	20	28	24
	Year	−11	16	−19	−20	−15	−7	2	10	16	16	17
Uelen, 1937 [5]	Winter	−10	−10	−8	−5	0	2	3	4	5	4	3
	Equinox	−24	21	−15	−9	−2	2	5	6	8	12	10
	Summer	28	−22	−14	−4	−1	5	16	13	17	20	16
	Year	−21	−18	−12	−6	−1	3	8	8	10	12	10
Srednikan, 1948 [6]	Winter	−11	−15	14	10	−3	2	1	4	3	2	2
	Equinox	−30	−31	−32	22	−10	1	8	11	12	11	10
	Summer	−48	−46	−37	−23	−7	4	15	21	20	20	18
	Year	−30	−32	−28	−18	−7	3	9	12	12	11	10
Yakutsk, 1948 [7]	Winter	−6	−10	−12	−12	−9	3	1	3	3	2	2
	Equinox	22	−29	−34	−32	−23	−9	3	12	14	12	11
	Summer	43	−48	44	35	−21	−6	8	20	26	24	20
	Year	23	−29	−30	−26	−18	6	4	12	14	12	11
Leningrad, 1948 [8]	Winter	0	2	1	[illegible]	4	4	3	4	−10	−14	−14
	Equinox	6	8	8	8	8	6	−2	−14	25	30	−29
	Summer	6	9	11	9	1	−3	15	26	−36	−31	31
	Year	3	6	[illegible]	7	5	2	5	−15	−24	−28	−25
Sverdlovsk, 1948 [9]	Winter	−1	2	2	2	1	−3	7	−10	10	−9	−7
	Equinox	4	6	6	3	4	−13	21	−26	−24	−16	8
	Summer	12	12	6	−2	−12	21	−29	−31	−28	−20	−11
	Year	5	6	5	1	−5	−12	−19	−22	−21	−15	−9
Kazan', 1948 [10]	Winter	−2	0	1	2	3	2	−2	6	−9	−10	−9
	Equinox	3	4	6	6	2	−3	−11	−20	24	−20	−11
	Summer	8	10	9	5	−3	−10	−21	28	−28	−24	18
	Year	3	5	5	4	1	−4	−11	−18	−20	−18	−14
Moscow, 1948 [11]	Winter	−1	1	1	3	4	4	1	−6	−10	−12	−12
	Equinox	5	6	6	7	6	2	−7	−18	−26	−25	−21
	Summer	6	8	10	8	1	−7	−16	−26	−31	−30	−24
	Year	3	5	6	6	4	0	−7	−17	−22	−23	−19
Irkutsk, 1948 [12]	Winter	0	−1	−8	−12	−13	−10	−6	−3	1	−1	−2
	Equinox	−1	−10	−22	−30	−32	−24	−11	2	10	10	6
	Summer	−8	−22	−35	−40	−37	−29	−17	−1	8	14	14
	Year	−3	−11	−21	−27	−27	−21	11	−1	6	7	6
Odessa, 1948 [13]	Winter	−3	−2	−2	1	3	4	4	0	−4	−7	−6
	Equinox	0	0	0	2	3	−1	−6	−12	−13	−10	−6
	Summer	1	2	1	4	0	−7	−15	−20	−20	−13	−6
	Year	0	0	1	2	2	−1	−5	−10	12	−10	−6
Vladivostok, 1947 [14]	Winter	12	−21	−24	−18	10	−2	4	5	5	4	4
	Equinox	−31	38	−35	−23	−7	5	12	12	9	6	7
	Summer	−34	36	−29	−16	−2	8	10	12	13	7	4
	Year	−27	33	30	19	−6	4	9	10	9	6	5
Tbilisi, 1948 [15]	Winter	−6	[illegible]	−2	0	1	5	4	0	−3	−2	1
	Equinox	−3	2	−1	0	−2	−8	−13	12	−8	1	5
	Summer	0	2	4	2	6	−13	−19	16	−8	0	6
	Year	−3	1	0	1	−1	−5	−9	10	−6	0	4
Tashkent, 1948 [16]	Winter	−3	1	0	3	4	1	−3	4	−2	−2	−2
	Equinox	0	2	1	−3	−10	−14	−13	−8	−2	3	5
	Summer	1	5	1	−8	−15	18	−15	−8	−2	4	6
	Year	0	2	1	3	7	−10	−10	−7	−2	2	3

	11	12	13	14	15	16	17	18	19	20	21	22	23	Amplitude
[1]	10	3	−2	−2	−9	−9	−7	3	0	2	2	0	−2	29
	15	10	12	7	3	0	2	6	4	7	5	2	2	35
	34	34	33	22	4	−2	0	8	2	3	9	1	−17	77
	19	16	15	9	−1	−3	−2	6	2	4	5	1	−6	44
[2]	8	14	10	10	6	2	−7	12	−9	−8	−1	−4	0	26
	13	12	14	9	8	4	0	0	1	−4	−12	−7	−3	24
	13	18	19	17	20	15	4	−9	−6	−4	−4	5	10	17
	11	14	14	12	11	8	−1	7	5	−6	7	−2	2	25
[3]	5	10	9	11	14	13	10	−3	−25	−28	−9	−7	−6	42
	2	4	6	7	9	12	11	1	−4	0	−12	11	−12	27
	0	9	17	18	27	29	22	7	0	6	−22	−10	−4	51
	2	8	11	12	17	18	14	2	−10	−12	−15	−10	−7	33
[4]	11	10	9	2	−2	−8	−12	−6	−5	−3	−2	2	4	22
	28	30	27	19	14	−15	−11	−12	−12	−10	−9	10	−5	50
	26	34	36	24	16	11	5	1	−12	9	16	25	−30	70
	22	24	24	15	10	−1	−6	−6	−9	−7	−9	−11	−10	11
[5]	3	−2	2	3	3	4	4	3	0	0	−1	−5	8	15
	10	10	10	10	8	7	6	4	2	−3	−8	−13	−18	36
	16	13	15	15	12	10	6	−1	−1	−14	−25	29	−30	56
	10	7	9	9	8	7	5	2	0	−6	11	−16	−19	34
[6]	2	3	3	5	4	4	4	4	4	1	4	2	−3	19
	11	12	12	12	12	12	10	6	6	5	2	5	−14	46
	20	20	18	16	15	14	13	11	7	1	12	−28	−37	60
	12	12	11	10	10	10	9	7	5	3	−2	−10	−18	41
[7]	2	2	2	2	3	4	3	4	3	4	4	5	4	17
	10	10	11	11	11	12	11	7	5	5	3	1	4	18
	20	20	20	15	18	16	14	10	6	2	4	14	−26	64
	11	10	11	9	10	11	9	7	5	4	1	−3	−9	11
[8]	−12	−8	−4	−2	1	1	6	7	8	8	7	6	6	22
	−22	−13	−7	−1	4	7	12	12	13	14	14	13	13	41
	22	−9	3	12	11	16	18	20	17	14	12	12	11	59
	18	10	−3	4	6	9	12	13	13	12	11	10	10	41
[9]	−4	−2	0	0	3	4	6	7	6	7	6	5	6	17
	−2	2	1	3	6	8	10	10	11	11	11	10	10	37
	0	8	11	11	10	11	14	13	11	10	9	10	11	15
	−2	2	4	5	6	8	10	10	9	9	9	9	9	32
[10]	−8	−4	−2	−1	1	3	4	5	6	6	6	4	4	16
	−8	−4	−2	0	4	6	8	9	9	10	11	10	9	35
	−9	0	7	9	9	10	12	12	11	10	9	10	8	40
	−8	−3	1	3	5	6	8	9	8	9	8	8	7	29
[11]	−10	−7	−4	−2	1	3	5	7	7	7	7	6	6	19
	−14	−8	−4	0	3	7	9	11	11	12	13	12	12	39
	−15	−5	4	9	10	10	12	14	13	11	10	10	8	45
	−13	−7	−2	2	4	7	9	11	10	10	10	10	8	34
[12]	−1	0	2	2	4	5	5	6	4	6	7	8	9	22
	4	4	6	7	9	10	11	10	7	8	9	11	10	43
	13	12	11	12	12	13	13	12	12	11	11	14	8	54
	5	5	6	7	8	9	9	9	8	8	10	11	9	38
[13]	−4	−4	−4	−3	0	1	2	4	5	5	5	4	1	12
	−2	0	−2	−2	0	2	4	4	6	7	7	7	8	21
	0	4	4	4	4	4	6	8	8	8	8	8	6	28
	−2	0	−1	0	1	2	4	6	6	7	7	6	6	19
[14]	3	3	4	4	4	5	4	4	4	5	6	9	4	43
	6	7	8	8	8	8	7	7	8	8	10	8	−6	50
	6	8	9	8	8	7	7	7	8	11	8	−1	−18	19
	5	6	7	7	7	7	6	6	7	8	8	4	−8	43
[15]	−3	−5	−4	−2	0	0	2	3	3	4	4	3	4	11
	6	3	−2	−3	−1	1	2	3	5	6	5	4	6	19
	9	8	4	2	0	1	1	4	4	4	4	4	3	28
	4	2	0	−1	−1	1	2	4	4	4	4	4	4	11
[16]	−4	−4	−2	−2	−1	0	1	3	2	3	5	3	4	8
	3	0	−1	−1	1	3	4	4	5	5	5	5	6	20
	7	5	2	1	1	3	4	4	4	3	3	4	5	25
	2	0	0	−1	0	2	3	4	4	4	4	4	5	15

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TABLE 24

SOLAR DAILY GEOMAGNETIC VARIATIONS OF VERTICAL COMPONENT (Z) FOR QUIET DAYS (GAMMAS) YEARS OF LOW MAGNETIC ACTIVITY

Obseraatory and observation year	World time	1	2	3	4	5	6	7	8	9	10	
Bukhta Tikhaya, 1944 [1]	Winter	23	19	11	−6	−12	−12	−9	6	−4	6	1
	Equinox	28	26	15	−3	−12	−8	−2	0	0	3	4
	Summer	32	22	−2	−11	−13	−9	4	6	11	14	8
	Year	27	22	8	−7	−12	−10	−2	0	2	1	[illegible]
Mys Cholyuskin, 1944 [2]	Winter	−23	−21	−21	−14	−10	−5	−2	−1	1	2	[illegible]
	Equinox	−28	−25	−20	−14	−9	−4	1	−1	1	3	[illegible]
	Summer	−22	−20	−17	−13	−9	−7	−3	−2	1	2	[illegible]
	Year	−24	−23	−19	−14	−9	−5	−1	−2	2	2	[illegible]
Dikson, 1944 [3]	Winter	−6	−5	−3	−2	0	0	0	−2	−1	1	[illegible]
	Equinox	−10	−8	6	−2	−2	−2	−1	0	2	5	[illegible]
	Summer	−4	−3	−2	3	0	−2	0	0	4	4	8
	Year	−6	−5	−4	0	1	−1	0	−1	1	1	[illegible]
Matochkin Shar, 1944 [4]	Winter	−1	−3	−2	−5	−6	−5	[illegible]	0	1	5	8
	Equinox	−4	−2	−6	−6	−8	−8	−6	1	0	2	[illegible]
	Summer	1	−2	−2	−3	−6	−6	−6	[illegible]	−2	1	2
	Year	−1	−2	−3	−5	−7	−6	−5	−2	0	2	[illegible]
Tiksi, 1944 [5]	Winter	1	5	5	4	2	2	2	2	1	1	3
	Equinox	4	7	13	13	14	10	6	3	3	4	3
	Summer	12	17	19	18	16	12	8	4	2	0	0
	Year	6	10	13	12	11	9	6	3	2	2	2
Uelen, 1943 [6]	Winter	0	3	4	4	5	5	6	7	8	10	8
	Equinox	4	7	8	7	8	8	8	9	11	11	10
	Summer	−1	1	3	6	8	12	11	10	8	6	4
	Year	1	4	5	6	7	8	8	9	9	9	7
Sverdlovsk, 1944 [7]	Winter	−1	−1	0	0	0	0	0	−1	−1	0	1
	Equinox	0	0	2	3	2	1	−2	5	−6	−4	−1
	Summer	2	2	1	2	1	−2	−5	−7	−7	−5	−2
	Year	0	0	1	2	1	0	−2	−4	5	−3	0
Kazan', 1944 [8]	Winter	−1	−1	−1	0	0	−1	−2	−2	−1	−1	0
	Equinox	−1	0	0	2	2	2	0	−4	−6	−6	−4
	Summer	2	2	1	0	0	−1	−4	−5	−7	−6	−4
	Year	0	0	0	0	0	0	−2	−4	−5	−4	−2
Irkutsk, 1944 [9]	Winter	0	1	0	1	1	1	1	2	0	0	−1
	Equinox	2	1	−1	−3	−4	−6	−4	3	0	2	2
	Summer	0	−2	−5	−6	−7	−7	−5	−2	−1	2	4
	Year	1	0	−2	−3	−4	−4	−3	−1	0	1	2
Vladivostok, 1944 [10]	Equinox	−3	−7	−9	−8	−7	−5	1	2	2	1	2
	Summer	−5	−7	−9	−8	−8	−5	3	−1	1	2	2
	Year	−3	−6	−8	−7	−6	−4	−1	1	2	1	1
Tbilisi, 1944 [11]	Winter	0	0	0	0	0	1	0	−2	−2	1	0
	Equinox	2	2	3	5	5	4	−3	−8	−10	−9	−8
	Summer	3	4	6	6	4	2	−3	−7	−9	−10	−9
	Year	2	2	3	4	3	2	−2	−6	−7	−7	−6
Tashkent, 1944 [12]	Winter	0	0	1	1	0	−2	−2	−2	0	1	2
	Equinox	2	3	4	4	1	−5	−8	−8	−6	−4	−1
	Summer	5	6	5	3	2	−6	−10	−9	−8	−6	−4
	Year	2	3	3	2	0	−1	−6	−6	−5	−3	−1

	11	12	13	14	15	16	17	18	19	20	21	22	23	amplitude
[1]	−19 −10 −6 −12	−25 20 −27 −24	−26 −20 41 −29	25 22 −16 −31	18 −15 −43 −25	−8 −10 −34 17	4 2 −13 −3	15 2 8 8	15 6 18 13	31 8 30 23	30 10 24 22	20 16 28 21	20 17 40 26	57 50 56 58
[2]	−2 −3 −7 −4	−10 −9 −20 −13	−9 −14 25 −16	−16 −10 25 17	12 4 −8 5	0 11 17 10	28 24 27 26	27 21 42 30	20 26 40 29	38 21 34 31	19 18 18 19	7 6 10 8	−4 −9 −18 10	62 [illegible] 67 55
[3]	10 9 12 10	12 10 14 12	13 10 16 13	8 9 14 11	5 2 8 4	−5 1 −2 2	−13 4 −4 −7	−5 3 −8 −3	2 0 5 −1	4 2 15 3	0 3 −11 −5	−2 7 16 −9	−5 8 18 −10	26 20 31 23
[4]	10 8 8 9	13 11 16 13	16 12 18 15	16 11 18 15	10 5 16 10	−2 0 1 0	−22 −8 −10 −13	18 −2 −17 −12	−9 7 10 −8	−12 1 5 −5	−1 2 3 −1	5 −1 6 1	6 2 [illegible] 4	38 20 35 28
[5]	4 4 0 3	7 6 5 6	5 4 6 5	4 0 3 2	1 −8 −5 −5	−6 −14 −14 −12	−12 −15 −18 −15	−10 −12 −20 −14	−4 −14 −22 −14	−4 −9 −19 −11	5 9 −14 −10	3 −9 −13 8	−1 −6 −3 −3	19 29 41 28
[6]	4 6 2 4	1 0 −2 −1	−2 −7 −7 −5	−5 −14 −8 9	−6 −16 5 9	−7 −15 −4 −9	−8 −11 −4 −7	−6 −10 −3 −6	−7 −8 −4 −6	−6 −7 −6 −6	−6 7 −8 −7	−4 −5 −8 −6	−3 −1 8 −5	18 27 20 18
[7]	1 1 2 1	1 2 4 2	1 1 4 2	1 2 4 2	1 1 2 2	1 2 2 2	1 1 2 1	0 1 1 1	−1 0 1 0	−2 0 0 0	−2 0 0 −1	−2 0 0 −1	−2 0 0 1	3 9 11 7
[8]	2 1 0 0	2 1 1 1	1 1 2 2	1 1 3 2	2 1 2 2	2 2 2 2	2 2 2 2	1 2 1 1	1 1 1 1	0 1 1 1	0 0 1 0	−1 0 0 0	−1 0 1 0	4 8 10 7
[9]	0 1 3 1	0 1 2 1	0 1 2 1	0 1 2 1	0 1 2 1	0 1 2 1	0 2 2 1	0 1 2 1	1 1 2 1	−1 1 2 0	1 0 3 1	−1 0 3 1	−2 0 2 0	4 8 11 6
[10]	1 2 2	2 2 2	2 2 2	2 2 2	3 3 2	3 3 2	3 3 2	3 4 3	2 4 2	2 6 3	3 6 3	3 3 2	3 −1 1	12 15 11
[11]	2 −5 −7 −4	2 −1 −4 −1	1 −1 −1 0	0 1 2 1	0 1 2 1	0 2 2 1	0 3 2 2	1 3 2 2	0 4 2 2	1 3 2 2	1 3 2 2	0 2 2 2	0 2 2 1	1 15 16 11
[12]	1 1 0 0	0 1 2 1	0 1 2 1	0 1 1 1	0 2 2 1	1 2 2 2	0 2 2 1	0 2 2 2	0 2 2 1	0 2 2 1	0 2 2 1	0 2 2 1	0 1 2 1	4 12 15 9

TABLE 25

SOLAR DAILY GEOMAGNETIC VARIATIONS OF VERTICAL COMPONENT (Z) FOR

QUIET DAYS (GAMMAS) YEAR OF HIGH MAGNETIC ACTIVITY

Observatory and observation year	World time	1	2	3	4	5	6	7	8	9	10	
Bukhta Tikhaya, 1937 [1]	Winter	17	15	8	1	-4	-3	0	2	-6	-9	-8
	Equinox	7	15	6	-4	-7	2	0	2	0	1	-3
	Summer	24	24	15	4	-2	-1	4	17	11	2	2
	Year	16	18	10	0	-4	-2	1	7	2	-2	-3
Dikson, 1937 [2]	Winter	-7	-7	-3	-2	-1	2	3	5	7	8	8
	Equinox	-7	-7	-4	-4	2	1	1	1	5	7	8
	Summer	-7	-6	-4	4	-3	-3	-1	4	6	13	12
	Year	-7	-6	-4	-3	-2	0	1	1	6	9	9
Matochkin Shar, 1937 [3]	Winter	-7	-4	-4	-5	-1	-3	0	2	5	7	8
	Equinox	1	1	0	-3	-3	-5	-4	2	1	4	6
	Summer	4	5	0	-5	-8	-8	-3	4	0	2	4
	Year	-1	1	-1	4	-5	-5	-2	-1	2	4	6
Tiksi, 1947 [4]	Winter	-8	0	8	15	15	15	12	12	11	11	15
	Equinox	-4	9	20	30	35	32	25	18	13	9	4
	Summer	8	22	30	35	27	21	22	17	10	4	1
	Year	-2	11	20	27	26	23	20	16	11	8	7
Uelen, 1937 [5]	Winter	6	4	6	6	6	5	5	5	5	7	3
	Equinox	8	8	8	6	3	1	-1	-1	0	-4	-6
	Summer	2	2	4	5	6	6	6	0	5	7	3
	Year	5	5	6	6	5	4	3	1	3	3	0
Srednikan, 1948 [6]	Winter	2	3	3	2	2	2	2	1	1	2	2
	Equinox	0	1	1	0	0	0	2	2	3	3	4
	Summer	-7	-7	-6	-3	0	4	6	8	8	6	5
	Year	-2	-1	-1	0	1	2	3	4	4	4	4
Yakutsk, 1948 [7]	Winter	2	3	4	3	2	2	2	2	2	2	3
	Equinox	1	2	2	1	2	4	4	3	0	-4	-7
	Summer	0	1	2	3	4	3	1	-2	-5	-8	-10
	Year	-2	2	0	1	1	2	2	1	-2	-4	-6
Sverdlovsk, 1948 [8]	Winter	0	0	0	1	2	0	-2	-2	2	-2	0
	Equinox	0	2	4	6	5	2	-3	-8	-10	-8	-4
	Summer	3	4	4	3	0	-3	-8	-11	-11	-9	-6
	Year	1	2	3	3	2	0	-4	-7	-8	-7	-3
Kazan', 1948 [9]	Winter	0	0	0	0	0	0	-2	-4	-4	-4	-2
	Equinox	0	1	2	4	4	3	-2	-7	-10	-11	-8
	Summer	3	4	4	2	1	-1	-6	-10	-13	-12	-8
	Year	1	2	2	2	2	0	-3	-7	-9	-9	-6
Moscow, 1948 [10]	Winter	-1	-1	-1	0	0	0	0	-2	-4	-4	-4
	Equinox	1	1	2	4	6	6	5	0	8	-13	-13
	Summer	2	4	6	6	6	4	1	5	-11	-16	-15
	Year	1	1	2	3	4	4	2	-2	-8	-11	-11
Irkutsk, 1948 [11]	Winter	1	2	0	-1	2	2	-2	-1	2	2	2
	Equinox	6	4	1	3	-7	-10	-9	-6	-2	1	2
	Summer	2	0	-4	-8	-11	-12	-10	-7	-2	4	7
	Year	3	2	-1	-4	-7	-8	-7	-5	1	2	3
Odessa, 1948 [12]	Winter	2	2	2	2	1	2	0	-2	-5	6	-5
	Equinox	4	4	3	4	5	6	4	-1	-7	-11	-12
	Summer	4	4	5	6	5	2	0	-3	-7	-10	-11
	Year	3	3	3	1	1	3	1	-2	-6	-9	-9
Tbilisi, 1948 [13]	Winter	1	1	1	0	0	0	-2	-5	-7	-7	-4
	Equinox	1	4	4	6	8	6	-2	-9	-14	-15	-13
	Summer	5	7	10	10	7	3	-5	10	-14	-16	-14
	Year	3	4	5	5	5	3	-3	8	-12	-13	-10
Tashkent, 1945	Winter	3	3	3	1	2	2	-6	-8	-6	-4	-2
	Equinox	5	6	8	7	2	4	-9	-12	-12	8	-3
	Summer	12	4	10	6	-2	-9	-15	-18	-16	12	-6
	Year	7	8	7	5	1	-5	-10	-12	11	-8	4

POOR ORIGINAL

	11	12	13	14	15	16	17	18	19	20	21	22	23	Amplitude
[1]	-8	-18	-17	-12	-10	-6	4	6	9	8	9	10	14	35
	-10	-20	-16	-15	-14	-9	-3	6	11	12	11	14	19	39
	0	-14	-21	-32	-39	-35	-22	-2	0	9	15	20	16	63
	-6	-17	-18	-20	-21	-17	-7	3	7	10	12	15	16	39
[2]	7	6	5	1	-7	-2	-3	-1	-2	-3	-6	-5	-7	15
	11	7	7	6	3	0	-2	-1	0	-5	-4	-8	-11	22
	10	10	7	4	4	0	-5	-7	-5	-2	-5	-10	-9	23
	9	8	6	4	0	-1	-3	-3	-2	-3	5	-8	-9	18
[3]	11	12	8	7	0	-2	-4	-7	-9	-2	-1	-5	-7	21
	9	8	10	5	3	-2	-6	-8	-3	-4	-2	0	-4	18
	7	10	7	7	5	1	-8	-16	-5	4	-3	0	1	26
	9	10	8	6	3	-1	-6	-10	-6	-1	-1	-1	-2	20
[4]	18	15	12	5	-5	-16	-25	-21	-23	-22	-18	-14	-13	43
	6	3	3	-2	-7	-14	-24	-30	-26	-30	-26	-30	-17	65
	1	2	5	0	-6	-12	-18	-26	-33	-34	-30	-26	-16	69
	8	6	7	1	-6	-14	-23	-26	-27	-29	-25	-23	-15	56
[5]	-3	-11	-10	-9	-15	-8	-7	-3	-4	-2	1	4	4	22
	-5	-6	-10	-8	-5	-4	-1	-2	0	1	1	2	5	18
	1	-2	-2	-6	-3	-3	0	-2	-4	-6	-8	-7	-1	15
	-2	-7	-7	-8	-8	-5	-2	-2	-2	-2	-2	0	1	14
[6]	2	2	0	-2	-3	-3	-4	-3	-3	-2	-2	-0	0	7
	2	3	1	0	-1	-2	-2	-3	-2	-2	-2	3	-2	7
	4	4	2	2	1	2	1	0	-2	-4	-5	-8	-10	18
	3	3	1	0	-1	-1	-2	-2	-2	-2	-3	-4	-4	8
[7]	2	2	1	0	-1	-2	-3	-4	-4	-4	-4	-3	-2	8
	-6	-2	1	4	3	2	2	2	1	1	0	-2	-4	11
	-8	-4	-1	3	5	5	4	4	3	2	1	-1	-2	15
	-4	-2	1	3	3	3	3	3	2	1	0	2	-3	9
[8]	2	3	2	2	2	2	1	1	0	-1	-2	-2	-2	5
	0	4	4	3	2	2	2	1	1	0	0	-1	1	16
	1	4	5	5	4	2	2	2	2	2	2	2	2	16
	1	3	4	3	3	2	2	1	1	0	0	0	0	11
[9]	0	2	3	2	2	2	2	2	0	0	-1	-1	-2	7
	-3	2	5	4	3	3	3	2	2	1	0	0	0	16
	-1	3	5	5	4	3	3	3	2	2	2	1	1	18
	-1	2	4	4	3	3	3	2	1	1	0	0	0	13
[10]	-2	2	3	3	2	3	3	3	2	1	1	0	-1	7
	-10	-4	2	3	3	2	3	3	2	2	1	0	-1	19
	-10	-5	0	4	6	4	4	3	4	3	2	2	1	22
	-8	-2	2	3	4	3	3	3	3	2	2	1	0	15
[11]	1	2	2	1	2	1	0	0	0	-1	-1	-1	-1	4
	1	2	2	2	2	1	1	1	0	0	0	1	2	16
	6	4	3	2	2	3	2	3	3	4	5	5	4	19
	3	3	2	2	2	2	1	1	1	1	1	2	2	11
[12]	-4	-1	0	1	2	1	1	1	1	0	0	0	0	8
	-10	-6	-3	0	2	2	2	2	3	3	2	2	2	18
	-10	-7	-4	1	3	2	2	3	3	3	3	3	2	17
	-8	-5	-2	1	2	2	2	2	2	2	2	2	1	15
[13]	2	1	2	3	3	3	3	3	2	1	1	0	0	10
	-7	-2	1	2	2	3	3	4	4	4	4	3	3	23
	-12	-6	0	3	3	2	3	4	5	5	5	5	5	26
	-7	-3	1	2	3	3	3	4	4	3	3	3	3	18
[14]	0	1	1	1	2	2	2	2	2	1	1	0	0	12
	-1	1	0	0	2	2	2	2	2	2	2	2	2	20
	0	4	3	2	2	2	2	2	3	3	3	4	5	32
	0	2	1	1	2	2	2	2	2	2	2	2	2	20

TABLE 26

SOLAR DAILY GEOMAGNETIC VARIATIONS OF DECLINATION (D) FOR DISTURBED DAYS (MINUTES) YEARS OF LOW MAGNETIC ACTIVITY

Observatory and observation year	World time	1	2	3	4	5	6	7	8	9	10
Bukhta Tikhaya, 1944 [1]	Winter	35.3	33.3	32.2	29.4	6.0	−2.8	−9.7	0.0	0.2	8.7
	Equinox	43.4	59.3	43.8	50.8	11.5	−16.2	0.7	19.7	21.1	16.6
	Summer	38.1	64.8	48.8	57.6	23.8	20.0	19.0	9.8	11.0	13.3
	Year	39.0	51.1	41.7	45.5	3.9	0.3	2.9	9.8	11.8	13.1
Mys Chelyuskin, 1944, [2]	Winter	50.5	21.8	−14.2	−26.4	−36.4	−35.8	−57.0	−46.2	−34.2	−16.8
	Equinox	69.8	38.4	25.8	−6.3	−27.4	−34.0	−27.1	−28.6	−32.7	−23.7
	Summer	105.8	49.0	35.1	15.9	4.4	−19.2	−26.8	−43.8	−19.4	−51.4
	Year	76.1	37.2	16.2	−5.1	−19.2	−29.2	−32.5	−34.1	−38.5	−30.5
Dikson, 1944 [3]	Winter	18.8	−1.8	−19.0	−22.3	−25.8	−27.7	−30.1	−28.5	−34.9	−35.6
	Equinox	46.7	23.7	11.7	−20.1	−25.8	−21.1	−23.2	−33.2	−39.6	−36.7
	Summer	54.1	29.8	27.9	22.2	10.9	−0.6	6.5	−21.4	−37.4	−51.8
	Year	39.9	17.2	7.0	−7.0	−13.7	16.6	−19.9	28.8	−37.3	−42.7
Matochkin Shar, 1944 [4]	Winter	19.1	12.9	−2.7	−9.5	−15.4	−14.1	−17.5	16.7	18.7	19.2
	Equinox	35.8	23.4	18.2	−3.5	−15.5	−11.7	−12.2	−14.0	−13.4	−13.7
	Summer	40.6	19.7	13.7	6.6	5.9	−2.1	−3.4	−10.3	−15.8	−24.2
	Year	31.8	18.7	9.7	−2.2	−8.4	−10.2	11.1	−13.7	−16.5	−19.3
Tikai, 1944 [5]	Winter	7.5	5.8	6.9	8.5	7.6	6.7	6.5	2.8	−1.3	3.8
	Equinox	3.0	5.0	5.1	−0.8	2.6	1.8	4.8	7.1	8.8	7.6
	Summer	0.9	2.3	1.8	−1.8	4.7	−4.5	−4.0	−2.8	−1.1	7.7
	Year	4.1	4.6	4.8	2.6	2.1	1.3	2.5	2.5	2.2	6.2
Uelen, 1943 [6]	Winter	−5.8	−4.5	−2.6	−1.7	0.2	0.6	5.6	6.1	5.9	0.4
	Equinox	−4.9	−5.2	−4.8	2.2	−1.8	−1.9	1.0	1.0	2.1	1.6
	Summer	−4.7	−3.9	4.0	3.3	−0.9	−2.5	0.3	1.1	0.5	−1.9
	Year	5.1	−1.6	−3.8	−2.4	−1.1	−1.6	2.1	3.7	2.8	0.0
Yakutsk, 1944 [7]	Winter	−1.1	−2.5	−2.4	−2.7	2.2	−0.8	−0.5	−0.2	1.0	0.6
	Equinox	−2.9	−4.5	−5.0	−7.0	−5.6	−4.1	−3.3	−1.8	0.7	2.5
	Summer	0.6	1.8	−4.0	−6.0	−7.6	7.7	7.1	−5.4	−3.3	0.3
	Year	−1.1	3.0	−3.8	−5.3	−5.2	−4.3	−3.7	−2.6	−0.6	1.8
Sverdlovsk, 1944 [8]	Winter	−2.4	−3.4	−3.9	−4.3	5.0	−4.2	−3.8	−3.6	−3.4	−2.6
	Equinox	−1.1	−2.1	1.2	−1.0	0.9	1.6	1.2	−0.3	2.0	−3.2
	Summer	1.5	3.2	4.0	4.1	3.2	2.8	0.9	−1.8	4.0	−5.8
	Year	−0.7	−0.8	−0.4	−0.1	−0.3	0.1	0.6	−1.9	−3.2	−3.9
Kazan', 1944 [9]	Winter	−1.8	−2.8	−3.4	−3.8	−4.4	−3.5	−3.3	−3.2	−3.1	−2.9
	Equinox	−0.4	−1.2	−1.0	−1.6	0.8	1.5	1.8	0.7	−1.2	−2.6
	Summer	1.0	2.1	3.4	3.6	3.5	3.2	1.8	0.2	−2.3	−4.5
	Year	0.4	−0.6	−0.3	−0.6	0.0	0.4	0.1	−0.8	−2.1	−3.4
Irkutsk, 1944 [10]	Winter	−1.3	−1.5	−1.7	−2.0	−2.4	−2.1	−1.7	−0.8	0.3	1.2
	Equinox	0.6	−0.2	0.6	−0.8	−1.6	−2.8	−3.2	−3.1	−2.0	−0.3
	Summer	4.4	4.2	3.0	0.6	−2.3	−4.4	−5.8	−5.8	−5.0	−3.0
	Year	1.2	0.8	0.6	−0.7	−2.1	−3.1	−3.6	−3.2	−2.2	−0.7
Vladivostok, 1944 [11]	Winter	−0.2	−0.7	−1.5	−2.0	−1.8	−0.8	−0.2	0.4	0.8	0.9
	Equinox	0.0	−1.1	−2.3	−3.1	−2.8	−2.3	−1.5	−0.2	0.6	0.9
	Summer	2.0	0.0	−1.6	3.2	−3.8	−3.6	−3.0	−2.3	−1.2	−0.1
	Year	0.6	−0.6	−1.8	−2.8	−2.3	−2.2	−1.6	−0.7	0.1	0.6
Tbilisi, 1944 [12]	Winter	−0.9	−1.2	1.5	1.6	−1.8	−1.4	−1.2	−1.4	−1.8	−2.0
	Equinox	−0.2	−0.4	−0.5	−0.3	1.1	2.0	1.7	0.4	−1.2	−2.5
	Summer	0.1	0.9	1.7	2.8	3.2	3.4	2.2	0.1	−1.7	−3.3
	Year	−0.2	−0.1	0.0	0.4	1.1	1.4	1.4	−0.2	−1.4	−2.4
Tashkent, 1944 [13]	Winter	−1.3	−1.8	−1.8	−1.4	1.4	−1.4	−1.5	−1.5	−1.2	0.4
	Equinox	−0.6	−0.8	0.0	0.9	1.1	0.8	−0.4	1.5	−2.0	−1.9
	Summer	1.1	[illegible]	3.4	3.3	2.3	0.7	−1.4	−2.8	−3.5	−3.6
	Year	−0.3	[illegible]	0.6	0.9	0.8	0.0	−1.1	1.9	−2.3	−2.0

	11	12	13	14	15	16	17	18	19	20	21	22	23		Amplitude
[1]	9.6	−3.7	−17.7	−22.9	−15.6	−38.9	−57.4	−40.4	13.4	−22.5	6.3	11.0	37.2	35.5	94.6
	9.7	−4.4	−25.9	−50.2	−39.2	−71.9	−60.5	−62.1	−41.6	−15.5	18.5	26.0	32.5	42.5	134.2
	1.8	−14.4	−30.8	−40.1	−42.0	−56.6	−77.4	−54.8	−41.8	−21.6	−5.0	12.6	23.8	37.2	112.2
	7.2	−7.6	−24.8	−37.8	−32.2	−56.5	−65.1	−52.1	−33.9	−20.0	7.0	17.5	30.5	38.3	116.2
[2]	−10.6	−7.1	−12.8	−26.2	−28.6	−33.7	−10.6	−3.6	−8.8	41.6	35.6	45.5	80.2	52.8	137.2
	−26.7	−31.2	−32.2	−39.3	−48.3	−51.2	−43.5	−5.1	25.8	45.3	49.9	47.2	85.6	72.1	156.8
	−58.3	−41.6	−57.2	−63.0	−46.2	−51.7	−38.2	−26.2	5.6	24.9	53.3	73.3	99.4	106.6	169.6
	−31.8	−27.6	−34.1	−26.8	−41.8	−45.8	−31.2	−11.9	7.4	36.7	45.8	51.7	87.5	76.4	133.3
[3]	−55.4	−46.2	−19.1	9.3	−1.4	3.1	21.7	42.3	29.7	51.8	47.5	58.1	46.0	20.9	98.5
	−53.2	−52.1	−54.9	48.5	−33.4	−22.6	−6.1	26.4	59.6	74.0	54.5	53.1	73.4	47.3	128.9
	−64.7	−63.6	−61.6	−51.0	−28.2	29.8	7.8	5.5	22.2	36.5	52.5	55.6	59.9	56.3	121.6
	−51.0	−51.9	−46.1	−33.2	−29.5	−16.4	2.6	24.8	37.3	54.2	51.8	49.2	59.8	41.4	111.7
[4]	16.8	−19.4	−11.1	0.7	11.3	1.2	5.9	9.0	−4.8	18.9	24.3	21.0	28.3	20.0	17.7
	23.8	−24.5	28.1	−27.6	−16.7	−17.3	−19.0	12.2	8.6	16.9	26.7	21.7	45.4	35.1	73.5
	31.2	−30.2	−30.8	−24.5	−14.2	−19.4	−12.5	8.3	0.8	7.4	27.4	25.3	[illegible]	10.8	71.6
	−24.2	21.8	−23.3	−17.1	−8.9	−11.8	−8.5	4.1	1.5	14.5	26.2	23.7	37.6	32.0	62.4
[5]	1.9	−0.9	−6.8	−6.9	−6.7	−0.9	0.6	−3.2	−9.7	−6.2	16.5	10.2	2.0	8.5	25.0
	5.1	5.3	−8.7	−13.4	−17.0	−14.7	−6.0	−0.5	−2.4	0.3	0.0	0.2	2.6	3.5	25.8
	10.2	10.8	1.1	1.4	−15.5	−12.4	−7.5	−4.3	2.5	1.2	5.0	5.1	3.9	1.4	26.3
	5.8	5.1	−3.7	−6.4	−13.1	−9.4	−4.6	−3.1	−3.7	1.8	−2.9	−1.9	2.6	4.1	19.3
[6]	4.3	3.0	−0.7	0.1	1.2	2.8	5.1	2.8	1.7	−1.4	3.8	−4.8	−5.7	−3.8	12.2
	−1.9	0.8	5.7	−2.5	0.0	6.1	8.0	5.0	5.4	2.3	−1.3	1.9	−5.7	−4.9	13.7
	−1.9	−4.0	1.8	0.5	0.0	−0.2	4.0	9.5	8.6	5.9	2.9	0.1	−3.5	−1.6	11.2
	0.1	−0.1	2.3	−0.6	0.4	2.9	5.7	5.7	5.2	2.3	0.7	−3.1	−4.9	−5.1	10.3
[7]	4.6	3.9	6.1	2.9	0.3	−0.5	0.9	−2.1	0.3	0.0	−0.1	−2.5	−4.5	−4.1	10.6
	2.9	5.6	3.5	1.9	3.5	1.6	3.2	2.2	1.8	2.2	2.8	2.0	−0.2	−1.7	12.6
	1.0	3.3	2.3	1.4	1.6	1.7	2.2	2.8	1.1	5.0	5.2	5.1	4.2	2.1	12.9
	2.8	4.3	4.0	2.0	1.8	1.1	2.2	1.3	2.2	2.4	2.5	1.5	−0.2	−1.3	9.6
[8]	−0.8	0.0	2.3	5.4	7.3	6.2	7.2	5.4	1.0	3.5	0.2	−1.0	−1.4	−1.6	[illegible]
	−4.1	[illegible]	−0.5	−0.5	1.3	1.3	2.5	2.3	2.5	2.8	3.0	1.3	−0.4	−1.8	[illegible]
	−6.4	−5.2	−3.8	−1.8	0.2	0.6	1.3	0.7	1.3	1.1	1.2	0.7	0.9	1.6	[illegible]
	−3.8	−2.6	−0.7	1.0	2.9	2.7	3.7	2.8	2.6	2.5	1.1	0.3	0.3	−1.6	7.6
[9]	−1.8	−0.6	0.7	3.4	5.5	5.0	7.0	6.2	3.9	3.6	1.1	−0.3	−1.1	0.5	11.4
	−3.8	−3.4	−1.9	−1.8	0.0	1.4	1.1	2.2	2.6	2.6	3.0	1.4	−0.2	−1.0	6.8
	−5.8	−5.6	−4.7	−2.5	−0.8	0.3	1.0	1.1	0.9	0.8	1.1	0.6	0.5	1.3	9.1
	−3.8	−3.2	2.0	0.3	1.6	2.2	3.0	3.2	2.5	2.4	1.7	0.6	−0.3	−0.1	7.9
[10]	2.0	1.7	3.4	4.6	2.6	1.7	1.8	0.5	0.8	−0.1	−1.0	−1.7	2.2	2.1	7.9
	0.5	1.4	0.7	0.9	1.7	0.8	1.5	1.4	1.3	1.7	1.6	1.1	0.4	−1.7	[illegible]
	1.6	[illegible]	0.3	0.0	0.0	0.3	0.4	0.4	1.6	1.6	1.7	2.3	3.2	4.0	10.2
	0.3	1.1	1.5	1.8	1.4	1.0	1.3	0.8	1.2	1.1	0.8	0.6	0.2	0.1	5.4
[11]	1.6	1.2	1.6	1.4	0.8	0.1	0.7	−0.2	0.6	0.2	−0.3	−0.9	−1.0	−0.6	3.5
	1.2	1.1	0.9	0.7	0.9	0.8	1.2	0.8	0.7	0.7	0.6	0.6	0.4	0.5	4.5
	0.0	0.2	0.2	0.3	0.4	0.4	0.7	0.9	1.5	1.8	2.1	2.9	2.9	2.1	6.7
	0.9	1.0	0.9	0.8	0.7	0.4	0.9	0.5	0.9	0.9	0.8	0.9	0.8	0.7	3.8
[12]	−1.1	−0.8	0.1	0.9	0.4	1.8	3.1	2.8	2.1	2.2	1.4	0.8	0.7	0.3	5.1
	−3.1	−2.3	−1.0	−0.8	−0.3	0.3	0.4	1.1	1.5	1.7	1.4	0.9	0.1	0.2	5.1
	−4.1	−3.9	−3.4	−2.3	−0.7	−0.2	0.2	0.2	0.5	0.5	0.7	0.5	0.6	0.7	7.5
	2.8	−2.3	−1.4	0.8	−0.1	0.5	1.1	1.2	1.4	1.4	1.2	0.7	0.5	0.3	4.2
[13]	0.4	0.6	1.2	2.2	2.8	1.8	2.2	1.7	1.4	1.0	0.0	−0.6	−0.8	−1.0	4.6
	−1.4	−0.5	0.9	0.4	0.1	0.2	0.5	0.8	1.0	1.2	1.3	0.7	0.0	0.0	3.4
	−3.1	−2.0	−1.2	−0.1	0.2	0.0	0.2	0.2	0.6	0.8	0.8	0.8	0.8	1.0	7.0
	−1.3	−0.6	0.0	0.5	0.9	0.7	1.0	0.9	1.0	1.0	0.7	0.3	0.0	0.0	3.3

TABLE 27

SOLAR DAILY GEOMAGENTIC VARIATIONS OF DECLINATION (D) FOR DISTURBED DAYS (MINUTES) YEARS OF HIGH MAGNETIC ACTIVITY

Observatory and observation year	World time	1	2	3	4	5	6	7	8	9	10
Bukhta Tikhaya, 1937 [1]	Winter	28.8	39.7	49.2	32.0	36.5	14.1	9.7	12.3	5.3	9.4
	Equinox	33.8	49.8	46.5	51.0	46.9	55.6	34.0	27.9	10.1	8.1
	Summer	39.0	46.0	65.5	74.0	60.5	49.1	47.7	52.3	42.2	38.6
	Year	34.4	45.2	54.2	56.8	48.4	40.0	30.3	31.1	19.4	18.9
Dikson, 1937 [2]	Winter	22.0	13.5	5.7	−7.1	−12.1	−12.6	−14.6	−14.8	−20.7	−27.2
	Equinox	56.9	38.3	18.1	20.5	7.5	1.5	−2.7	−12.1	−32.4	−36.9
	Summer	70.1	51.9	50.0	48.6	31.4	15.8	−3.5	−15.1	−20.2	−39.4
	Year	49.8	34.5	24.4	20.1	9.5	2.1	−6.7	−13.9	−24.5	−34.6
Matochkin Shar, 1937 [3]	Winter	23.3	12.1	4.4	−1.0	−3.3	−4.2	−8.5	−4.9	−7.2	−13.9
	Equinox	16.9	28.4	23.2	23.1	18.2	10.8	6.4	−1.3	−9.2	−11.6
	Summer	38.2	31.4	22.0	29.2	28.2	22.9	4.5	3.3	−4.8	−16.8
	Year	26.2	24.1	26.7	17.3	14.4	9.9	0.9	0.0	−7.1	−14.2
Tiksi, 1947 [4]	Winter	6.2	−0.2	1.2	3.7	2.9	5.3	9.0	9.5	12.4	17.2
	Equinox	11.3	8.6	5.7	7.7	5.6	7.8	17.0	22.6	28.9	19.3
	Summer	12.9	−0.1	−0.7	−1.7	−2.9	−2.7	3.4	17.1	22.4	19.7
	Year	9.7	2.4	1.7	2.9	1.6	3.2	9.6	16.2	21.1	18.6
Uelen, 1937 [5]	Winter	−3.4	−3.3	−3.7	−2.7	−3.1	−1.8	−2.0	0.0	1.2	−0.2
	Equinox	0.1	−2.3	−2.4	−5.3	−6.2	−5.2	−1.9	0.2	−3.1	−4.7
	Summer	−2.4	−3.2	−5.0	−5.4	−1.8	−4.0	−4.1	−5.9	−4.8	−9.7
	Year	−1.8	−2.9	−3.6	−4.3	−3.6	−3.6	−2.6	−1.8	−2.2	−4.8
Srednikan, 1948 [6]	Winter	−3.2	−3.4	−2.8	−2.9	−2.7	−2.0	−1.8	−1.3	−0.3	1.8
	Equinox	−2.8	−5.1	−7.1	−7.1	−6.8	−5.7	−4.3	−1.1	1.5	1.1
	Summer	−1.6	−5.9	−8.0	−9.0	−8.5	−6.5	−3.7	−1.6	−1.2	1.0
	Year	−2.5	−4.8	−6.0	−6.3	−6.0	−4.7	−3.3	−1.3	0.0	1.3
Yakutsk, 1948 [7]	Winter	−2.6	−3.0	−2.3	−2.7	−3.3	−3.2	−2.4	−1.5	−1.2	0.2
	Equinox	−1.5	−3.7	−5.8	−6.1	−6.8	−7.5	−6.9	−4.0	−0.8	−0.4
	Summer	3.3	−2.0	−5.6	−8.3	−10.2	−9.9	−7.6	−5.6	−2.3	0.5
	Year	−0.2	−2.9	−4.6	−5.7	−6.8	−6.8	−5.6	−3.7	−1.4	0.1
Leningrad, 1948 [8]	Winter	0.1	0.8	−1.3	−2.1	−3.5	−3.2	−1.7	−0.9	−1.0	−2.1
	Equinox	3.9	3.5	1.6	−0.2	−1.5	−1.1	0.8	2.5	0.6	−2.0
	Summer	3.8	3.0	4.2	4.3	4.5	7.1	8.0	5.7	3.1	−2.2
	Year	2.6	2.4	1.5	0.7	−0.2	0.9	2.4	2.4	0.9	−2.1
Sverdlovsk, 1948 [9]	Winter	−2.5	−2.9	−3.1	−2.8	−2.5	−2.2	−2.0	−2.2	−2.7	−3.8
	Equinox	−1.7	−2.4	−1.8	−0.2	2.8	3.0	1.1	−0.8	−3.4	−5.2
	Summer	3.7	4.0	5.2	6.1	6.4	6.2	5.0	0.2	−4.8	−8.2
	Year	−0.2	−0.4	0.0	1.0	2.2	2.3	1.4	−0.9	−3.6	−5.8
Kazan', 1948 [10]	Winter	−1.6	−1.6	−2.5	−2.5	−2.8	−2.0	−1.3	−1.3	−1.7	−2.8
	Equinox	−1.2	−1.0	−1.0	−0.3	1.1	2.0	1.6	1.1	−0.8	−4.0
	Summer	2.6	2.4	3.7	4.4	5.2	6.2	6.1	2.4	−2.0	−5.8
	Year	0.0	0.0	0.1	0.5	1.2	2.0	2.1	0.7	−1.5	−4.2
Moscow, 1948 [11]	Winter	−0.8	−0.7	−1.9	−2.4	−2.7	−2.2	−1.2	−0.9	−1.2	−2.2
	Equinox	0.4	0.4	−0.2	−0.9	−0.7	0.4	2.1	2.4	0.1	−3.1
	Summer	2.4	1.7	3.0	3.8	4.4	6.5	6.9	4.3	1.0	−4.0
	Year	0.7	0.5	0.3	0.2	0.3	1.6	2.6	1.9	−0.1	−3.1
Irkutsk, 1948 [12]	Winter	−1.9	−1.0	−0.2	−0.4	−1.4	−2.2	−2.7	−2.2	−1.6	−0.6
	Equinox	0.8	0.9	1.0	0.6	−0.8	−3.3	−5.2	−5.3	−3.8	−2.7
	Summer	6.8	5.4	4.0	1.4	−1.7	−4.8	−7.1	−8.6	−8.3	−5.8
	Year	1.9	1.8	1.6	0.6	−1.3	−3.5	−5.0	−5.4	−4.6	−3.0
Odessa, 1948 [13]	Winter	0.0	0.0	−0.9	−1.3	−1.6	−1.2	−0.4	0.3	−0.4	−1.7
	Equinox	1.2	1.1	0.8	0.2	−0.1	0.8	2.1	2.7	0.9	−1.9
	Summer	1.0	0.8	1.2	2.0	3.0	4.7	5.1	3.6	2.0	−1.4
	Year	0.7	0.6	0.4	0.3	0.5	1.4	2.3	2.2	0.8	−1.7
Vladivostok, 1947 [14]	Winter	2.0	1.2	−0.2	−1.5	−2.5	−2.0	−1.1	−0.6	−0.8	−1.0
	Equinox	2.8	0.9	−1.2	−2.9	−4.2	−4.5	−3.7	−2.5	−1.8	−0.6
	Summer	3.7	0.2	−2.6	−5.4	−6.4	−5.8	−4.6	−3.2	−1.3	0.3
	Year	2.8	0.8	−1.3	−3.3	−4.4	−4.1	−3.2	−2.1	−1.3	−0.4
Tbilisi, 1948 [15]	Winter	−0.6	−0.8	−1.3	−1.4	−1.4	−0.7	0.1	−0.2	−1.1	−2.1
	Equinox	−0.4	−0.4	0.0	0.4	1.8	2.9	2.4	1.2	−1.4	−3.5
	Summer	1.2	1.2	2.2	3.7	4.4	5.1	4.0	1.1	−1.7	−4.3
	Year	0.0	0.0	0.3	0.9	1.6	2.4	2.2	0.7	−1.4	−3.5
Tashkent, 1948 [16]	Winter	−1.4	1.5	−1.5	−0.7	0.0	0.1	−0.5	−1.0	−1.4	−1.3
	Equinox	−0.6	4.4	0.7	2.4	3.0	1.9	−0.5	−2.4	−3.6	−3.5
	Summer	2.1	4.1	4.5	5.0	4.2	2.4	−0.1	−3.0	−5.1	−3.7
	Year	0.0	4.4	1.2	2.2	2.4	1.5	−0.4	−2.1	−3.4	−3.5

	11	12	13	14	15	16	17	18	19	20	21	22	23		[illegible]
[1]	12.4	9.2	—0.9	—26.8	—34.4	—40.6	—60.3	—68.0	—41.4	—32.0	3.8	1.2	19.0	29.2	117.2
	12.5	1.1	—28.6	—59.3	—62.8	—76.6	—60.4	—56.2	—50.6	29.7	—17.7	8.7	23.2	32.7	132.2
	19.3	—31.1	—39.6	—56.1	—102.0	—82.4	—67.4	—62.6	—60.1	—45.3	—34.9	—6.6	13.2	37.1	176.0
	14.9	—6.9	—23.1	—47.5	—66.6	—66.3	—62.9	—62.6	—52.1	—35.1	—19.2	2.3	17.8	31.3	123.4
[2]	—24.8	—25.2	—37.3	—23.4	—26.6	—31.6	0.1	15.9	17.7	36.7	48.3	50.8	47.0	24.1	88.1
	—41.2	—40.8	—39.6	—19.5	—47.7	—41.5	—30.5	—8.8	5.7	18.9	39.5	48.6	69.5	58.0	119.0
	—65.2	—65.7	—74.6	—64.6	—56.4	—44.7	—37.1	—26.8	8.0	13.4	49.4	51.3	69.3	70.9	145.3
	—41.0	—14.3	—50.0	—45.5	—43.6	—40.2	—22.6	—6.9	4.6	22.5	46.3	50.5	61.6	50.9	111.6
[3]	—9.6	—12.9	—16.2	—8.5	—11.1	—7.4	—13.2	—5.0	—8.5	3.8	16.3	20.9	32.0	22.9	48.2
	—13.9	—19.7	—16.0	—15.4	—23.4	—30.1	—28.6	—23.9	—7.7	2.6	4.4	16.6	30.0	17.4	60.1
	—28.3	—35.9	—40.0	—37.9	—35.4	—29.3	—24.5	—21.4	—12.7	3.1	13.0	24.5	28.7	38.7	78.7
	—17.2	—22.8	—21.1	—21.7	—23.3	—22.3	—22.2	—16.4	—9.6	3.1	11.1	20.5	30.2	26.2	5.3
[4]	11.6	—0.2	—13.6	—22.9	—25.1	—25.2	—13.1	—9.4	2.1	10.3	10.3	0.8	1.5	6.0	42.1
	—6.2	—26.4	—33.2	—30.8	—32.3	—23.3	—10.1	—4.2	0.5	12.2	2.0	0.6	9.3	11.4	62.1
	12.2	—0.3	—9.8	—17.2	—23.5	—22.0	—23.1	—16.4	—6.3	2.2	3.5	8.9	11.5	12.7	45.9
	5.7	—8.9	—18.8	—23.5	—26.5	—23.4	—15.3	—9.8	—1.0	8.5	4.2	3.9	7.8	10.4	47.6
[5]	1.2	—4.6	—0.4	2.5	5.2	9.8	9.7	7.5	3.6	2.9	—2.2	—5.0	—5.4	—3.9	15.2
	—4.8	—1.6	—3.9	—0.2	6.0	8.8	9.0	6.4	6.7	4.6	—0.5	0.7	0.0	0.3	15.2
	—5.2	—6.0	—5.2	—2.4	—0.6	5.0	10.8	14.2	13.2	12.2	9.1	3.7	—0.6	—1.9	23.9
	—3.7	—4.1	—3.2	0.0	3.5	7.9	9.7	9.3	7.8	6.4	2.0	—0.3	—2.1	—2.0	14.0
[6]	1.0	0.2	1.6	2.6	3.3	4.5	4.1	5.1	6.1	3.9	—2.9	—3.4	—3.6	—3.4	9.7
	3.6	5.8	4.3	2.5	4.3	4.2	4.6	2.8	2.7	2.1	1.3	0.6	0.7	—2.0	12.9
	1.2	2.0	0.4	—0.2	1.3	1.3	2.9	5.2	6.9	7.0	6.9	5.3	4.1	0.2	16.0
	1.9	2.7	2.1	1.6	3.0	3.3	3.9	4.4	5.2	4.3	1.8	0.8	0.4	—1.7	11.5
[7]	—0.2	—0.8	2.4	2.0	5.2	5.2	5.4	3.4	4.6	4.7	—2.1	—2.2	—2.7	—2.8	8.7
	2.2	6.2	5.2	2.8	4.0	5.3	6.0	3.4	1.7	3.2	0.7	1.2	1.8	—0.2	13.7
	1.0	2.4	3.2	1.8	1.4	2.8	1.7	2.2	4.9	4.6	4.6	6.1	6.3	4.8	16.5
	1.0	2.6	3.6	2.2	3.6	4.4	4.4	3.0	3.7	4.2	1.1	1.7	1.8	0.6	11.2
[8]	—2.6	—3.5	—5.2	—1.8	—5.7	—3.1	—0.8	2.1	4.6	6.5	8.8	7.4	6.3	5.2	14.5
	—5.1	—7.3	—7.5	—5.6	—3.2	—1.3	0.5	0.8	1.8	4.0	5.0	4.7	2.0	3.1	12.5
	—6.4	—10.2	—10.5	—9.2	—6.6	—3.1	—0.8	—1.2	—1.1	0.0	0.2	2.2	1.6	4.0	18.5
	—4.7	—7.0	—7.7	—6.5	—5.2	—2.5	—0.4	0.6	1.8	3.5	1.6	4.8	3.3	4.1	12.5
[9]	—3.0	—2.4	—1.9	—1.6	0.1	3.2	5.4	5.6	5.8	4.6	4.4	2.6	2.1	1.5	9.6
	—5.4	—4.2	—2.1	0.0	1.0	1.1	2.0	2.1	2.8	3.4	2.8	2.6	1.0	0.7	8.8
	—9.6	—10.1	—6.6	—3.5	—1.4	0.0	0.7	—0.8	—0.5	—0.4	0.3	3.0	2.2	3.0	16.5
	—6.0	—5.6	—3.5	—1.7	0.1	1.6	2.7	2.3	2.7	2.5	2.5	2.8	1.9	1.7	8.8
[10]	—3.0	—2.9	—2.7	2.1	1.3	1.4	3.6	4.4	4.8	4.7	5.4	2.4	3.0	2.2	8.4
	—5.2	—5.1	—3.8	—1.6	0.0	0.9	1.6	1.4	2.3	3.6	3.3	2.7	1.3	1.2	8.8
	—7.9	—9.4	—7.5	—4.7	—2.2	0.3	0.8	—0.6	—0.4	—0.2	0.1	2.2	1.7	2.4	[illegible]
	—5.3	—5.8	—4.7	—2.8	—1.2	0.9	2.0	1.7	2.3	2.7	2.9	2.4	2.0	1.9	3.7
[11]	—2.8	—3.4	—3.9	—2.8	—2.6	—0.1	2.4	3.2	4.2	4.8	6.3	4.6	3.7	2.8	10.2
	—5.4	—6.1	—5.5	—2.8	—1.1	0.2	1.5	1.8	2.4	3.7	1.2	3.6	1.3	1.6	10.3
	—7.4	—10.0	—8.8	—6.5	—3.9	—0.9	0.7	—0.1	—0.2	0.5	0.0	2.1	1.3	2.3	16.9
	—5.2	—6.5	—6.0	—4.1	—2.5	—0.3	1.5	1.6	2.1	3.0	3.5	3.4	2.1	2.3	10.0
[12]	—0.7	—1.1	0.5	0.8	2.9	3.8	3.4	3.0	3.2	2.2	—0.2	—0.6	—1.2	—1.4	6.5
	—0.4	1.7	2.2	1.0	1.6	2.2	2.6	1.8	1.3	1.5	—0.1	0.3	0.8	1.0	7.9
	—2.8	—1.1	0.6	0.4	0.1	1.0	0.2	0.3	1.4	1.6	1.8	3.8	5.0	6.5	15.4
	—1.3	—0.2	1.1	0.7	1.5	2.4	2.1	1.7	2.0	1.8	0.5	1.1	1.5	2.0	7.8
[13]	—2.1	—2.8	—3.2	—2.4	—1.9	—0.7	0.6	1.4	2.2	3.2	4.2	3.5	2.8	2.3	7.4
	—3.9	—5.2	—4.8	—3.2	—1.8	—0.6	0.5	0.8	1.5	2.1	2.6	2.2	1.4	1.2	7.9
	—4.0	—5.8	—6.1	—4.8	—3.4	—1.3	—0.1	—0.1	0.0	0.2	0.3	1.1	0.7	1.3	11.2
	—3.4	—4.6	—4.7	—3.5	—2.4	—0.9	0.3	0.7	1.2	1.9	2.4	2.3	1.6	1.6	7.1
[14]	—0.9	—0.6	0.2	0.7	1.1	1.2	1.0	1.9	1.5	1.0	0.2	—0.7	—0.7	0.3	4.5
	—0.6	—0.4	1.2	1.8	1.5	1.4	2.8	2.7	2.1	2.1	1.1	0.6	0.3	0.3	7.3
	1.0	—0.1	0.1	0.1	—0.2	0.1	0.5	1.0	1.5	2.2	3.6	5.1	5.8	5.1	12.2
	—0.2	—0.4	0.5	0.8	0.8	0.9	1.4	1.8	1.7	1.9	1.6	1.7	1.8	1.9	7.2
[15]	—2.1	—1.8	—1.7	—1.3	—0.7	0.4	1.5	1.9	2.2	2.6	3.2	2.2	1.8	1.4	[illegible]
	—4.2	—3.8	2.6	—1.3	0.7	0.1	0.6	0.8	1.4	1.7	1.9	1.7	1.0	0.9	7.1
	[illegible]	6.6	5.4	—3.5	—1.6	0.0	0.2	—0.1	0.2	0.6	0.7	1.4	1.1	1.4	11.7
	—1.0	1.1	3.3	—2.0	—1.0	0.1	0.8	0.9	1.3	1.6	1.9	1.8	1.3	1.2	6.5
[16]	—0.9	0.7	—0.4	—0.4	0.3	1.3	1.8	2.0	2.0	1.6	1.3	0.8	0.5	0.1	[illegible]
	2.2	—1.0	—0.4	0.0	0.0	0.4	0.8	0.7	1.0	1.2	0.8	1.0	0.6	0.3	6.6
	—3.4	—4.6	2.2	—0.8	—0.4	0.1	0.1	—0.2	0.2	0.1	0.7	1.5	1.2	1.6	10.7
	2.8	[illegible]	1.0	—0.3	0.0	0.6	0.9	0.8	1.1	1.1	0.9	1.1	0.8	0.7	[illegible]

TABLE 28

SOLAR-DAILY VARIATIONS OF HORIZONTAL COMPONENT (H) FOR DISTURBED DAYS (GAMMAS) YEAR OF LOW MAGNETIC ACTIVITY

Observatory and observation year	World time		1	2	3	4	5	6	7	8	9	10
Bukhta Tikhaya, 1944 [1]	Winter	0	2	3	−6	29	50	62	49	46	29	12
	Equinox	7	−10	5	−29	9	54	57	38	5	−20	−55
	Summer	7	−18	−39	−34	7	3	15	45	50	29	6
	Year	1	−12	−12	−24	13	35	43	43	33	9	−13
Mys Chelyuskin, 1944 [2]	Winter	−34	−16	22	40	73	90	98	116	108	85	55
	Equinox	−52	−28	−6	18	52	70	96	90	61	40	6
	Summer	−65	−32	−20	−12	−12	22	56	92	109	111	94
	Year	−49	−25	−1	16	38	61	84	100	94	79	52
Dikson, 1944 [3]	Winter	−8	19	36	32	47	61	77	84	104	124	132
	Equinox	−64	−35	−14	25	43	44	64	90	103	97	140
	Summer	−57	−13	−23	−18	−15	3	13	46	78	121	132
	Year	−43	−10	−1	13	24	35	52	74	96	114	135
Matochkin Shar, 1944 [4]	Winter	−51	−28	3	8	16	35	54	61	84	104	122
	Equinox	−107	−54	−31	2	34	30	39	64	78	79	109
	Summer	−90	−52	−37	−28	−28	−8	−5	13	34	78	102
	Year	−82	−45	−22	−6	8	19	30	46	65	85	111
Tiksi, 1944 [5]	Winter	23	33	41	48	63	75	92	112	126	148	141
	Equinox	1	22	22	38	47	54	81	103	110	114	139
	Summer	−34	−28	−26	−17	1	17	46	77	110	135	132
	Year	−6	5	11	21	34	46	72	96	114	131	137
Uelen, 1943 [6]	Winter	52	60	67	78	80	90	98	98	81	39	−2
	Equinox	15	28	49	115	169	146	222	181	142	36	−108
	Summer	10	31	64	88	102	130	144	117	126	52	−47
	Year	27	41	61	95	118	123	156	132	117	43	−52
Yakutsk, 1944 [7]	Winter	12	10	10	10	10	9	7	−1	−4	−10	−10
	Equinox	0	−5	−14	−8	−6	4	6	7	3	4	4
	Summer	−21	−24	−22	−16	−6	5	10	15	17	15	14
	Year	−4	−9	−11	−6	−1	6	8	8	6	4	4
Sverdlovsk, 1944 [8]	Winter	6	8	9	10	7	4	1	−1	3	−2	−2
	Equinox	10	8	4	4	−2	−4	−16	−21	−20	−11	−6
	Summer	12	12	11	1	−9	−17	−24	−27	−22	−19	−10
	Year	9	10	8	5	−1	−6	−13	−16	−13	−10	−6
Kazan', 1944 [9]	Winter	6	7	9	12	10	7	4	2	3	2	−2
	Equinox	11	8	7	7	4	0	−8	−19	−22	−16	−14
	Summer	11	11	11	7	−2	−8	−18	−23	−24	−22	−15
	Year	9	9	9	9	4	0	−7	−13	−14	−12	−10
Irkutsk, 1944 [10]	Winter	14	12	8	5	4	6	6	3	1	−4	−5
	Equinox	12	2	−12	−14	−11	−3	−3	−4	−6	−5	−11
	Summer	1	−9	−16	−19	−18	−14	−9	−4	−3	−1	1
	Year	9	2	−6	−9	−8	−4	−2	−2	−3	−4	−5
Vladivostok, 1944 [11]	Winter	10	0	6	4	11	8	6	−2	−3	−6	−4
	Equinox	−8	−12	−10	−5	0	7	2	−2	−8	−6	−5
	Summer	−13	−14	−8	−2	3	7	6	3	−2	−6	−4
	Year	−4	−7	−6	−1	5	8	5	0	−4	−6	−4
Tbilisi, 1944 [12]	Winter	14	17	17	19	23	21	14	12	7	7	1
	Equinox	4	9	5	6	0	1	−8	−7	−5	−2	−1
	Summer	15	13	17	16	6	−4	−16	−17	−14	−12	−5
	Year	11	13	13	13	8	4	−5	−6	−5	−3	−2
Tashkent, 1944 [13]	Winter	12	14	15	16	15	10	7	7	8	4	0
	Equinox	15	14	10	7	0	−1	−5	−8	−9	−9	−12
	Summer	13	12	8	0	7	14	13	−10	−7	−5	−3
	Year	13	13	11	8	2	−2	−4	−3	−3	−3	−5

POOR ORIGINAL

	11	12	13	14	15	16	17	18	19	20	21	22	23	amplitude
[1]	−2	−35	−55	−91	−11	−17	−103	−17	39	4	21	0	−1	165
	−42	−29	−20	−46	−10	−5	13	12	5	−1	16	23	11	112
	5	−1	2	−21	−38	−25	−7	−1	−12	1	5	12	8	89
	−13	−22	−23	−52	−19	−14	−31	0	13	4	16	15	9	95
[2]	16	−54	−107	−73	−88	−90	−92	−33	−17	−9	−3	−48	−36	223
	−11	−24	−27	−20	−35	0	−10	−28	−37	−39	−26	−42	−48	148
	44	22	8	−34	−37	−28	−27	−28	−42	−32	−52	−60	−68	179
	17	−19	−42	−43	−53	−41	−43	−30	−33	−27	−28	−50	−52	153
[3]	148	102	21	−15	−70	−163	−192	−118	−139	−112	−89	−81	−9	340
	149	151	108	51	−64	−46	−155	−170	−141	−116	−78	−120	−63	321
	145	143	99	36	5	−60	−70	−76	−98	−120	−99	−98	−60	265
	147	132	76	26	−43	−92	−139	−121	−125	−116	−88	−99	−44	286
[4]	136	150	88	40	−14	−80	−158	−98	−106	−118	−102	−96	−52	308
	130	129	125	92	31	15	−82	−128	−131	−116	−76	−118	−111	261
	122	130	117	79	58	12	−18	−38	−57	−91	−95	−99	−95	229
	129	137	111	71	26	−18	−87	−88	−99	−109	−91	−104	−86	246
[5]	130	80	9	68	−95	−233	−251	−155	−144	−128	−79	2	15	399
	122	112	58	−35	−147	−134	−185	−188	−178	−103	−33	−19	−1	327
	124	104	52	−1	−71	−115	−125	−105	−86	−61	59	−39	−34	260
	125	100	42	−29	−105	−155	−182	−149	−135	−95	−55	−24	−8	319
[6]	−83	−134	−125	−178	−141	−116	−98	−42	9	15	39	53	50	276
	−180	−109	−162	−178	−158	−84	−51	−22	−17	−41	−8	4	11	402
	−146	−99	−115	−142	−97	−160	−48	−16	−22	−22	−15	4	5	290
	−136	−114	−135	−166	−133	−101	−66	−27	−11	−17	4	19	20	322
[7]	−6	−4	−2	−5	2	−5	−5	−10	−8	−6	−2	7	9	22
	1	10	8	4	−3	1	−3	0	−3	−2	0	−3	−6	24
	13	11	12	15	10	3	1	1	0	−4	−10	−16	−23	41
	3	6	7	6	3	0	−1	−2	−3	−4	−4	−5	−8	19
[8]	−3	−9	−3	−10	0	−2	4	−8	−4	2	−6	−5	−2	20
	−7	−3	−1	−2	4	4	12	16	8	10	7	5	2	37
	−8	−2	3	8	9	11	12	10	12	13	8	6	5	40
	−6	−5	−1	−1	4	5	9	6	6	8	3	2	2	26
[9]	0	−6	−12	−15	−9	−4	1	−4	−4	−4	−3	−2	−2	27
	−11	6	−2	−3	5	1	9	12	11	9	9	7	5	34
	−13	−7	−1	5	9	8	12	10	12	12	10	8	6	36
	−8	−6	−5	−4	2	2	7	6	6	6	5	4	3	23
[10]	−7	6	−6	−7	−3	−1	0	−8	−6	−6	4	0	4	22
	−7	−1	2	2	7	5	10	10	6	7	5	4	0	26
	1	0	4	12	10	10	10	9	9	9	7	5	−1	31
	−4	−2	0	2	4	4	7	4	3	3	3	3	1	18
[11]	−8	−2	−2	−4	−6	0	1	−3	−3	−1	−2	1	0	19
	−2	3	2	4	6	4	6	6	6	6	5	3	−5	19
	2	0	3	9	8	8	7	6	6	6	3	−5	−17	26
	−4	0	1	3	3	4	5	3	3	3	2	0	−7	15
[13]	−3	−18	−23	−35	−31	−23	−13	−16	−4	1	6	4	4	58
	−2	−4	−8	−9	−4	1	0	1	2	2	4	7	7	18
	−6	−10	−11	−6	−6	−3	2	4	7	10	10	10	5	34
	−4	−10	−13	−15	−12	−7	−3	−3	2	5	7	7	6	28
[14]	−4	−12	−17	−22	−14	−10	−6	−12	−7	−4	−2	−1	3	38
	−16	−11	−8	−8	−2	−3	4	7	6	6	7	8	7	31
	−6	−10	−6	−1	0	2	6	5	7	8	8	6	5	27
	−9	−11	−11	−10	−5	−4	1	0	2	3	4	5	5	24

TABLE 29

SOLAR-DAILY GEOMAGNETIC VARIATIONS IN HORIZONTAL COMPONENT (H) FOR DISTURBED DAYS (GAMMAS) YEAR OF HIGH MAGNETIC ACTIVITY

Observatory and observation year	World time		1	2	3	4	5	6	7	8	9	10
Bukhta Tikhaya, 1937 [1]	Winter	10	4	−10	1	−7	23	29	28	29	13	−8
	Equinox	12	19	20	−1	−11	0	20	6	0	−2	−37
	Summer	0	1	−12	−20	−10	−2	34	15	26	12	−10
	Year	7	8	−1	−6	−9	7	28	26	18	8	−18
Dikson, 1937 [2]	Winter	−88	−54	19	4	21	36	66	74	85	116	131
	Equinox	−18	−18	5	23	34	37	49	57	71	97	100
	Summer	−105	−43	23	26	35	47	64	63	92	108	100
	Year	141	−101	−85	−36	−4	25	86	91	93	142	191
Matochkin Shar, [3]	Winter	−45	−39	−17	0	20	25	39	42	50	72	89
	Equinox	−111	−109	−24	−2	7	29	44	48	75	76	98
	Summer	−155	−102	−116	−65	−36	−13	39	59	60	111	158
	Year	−103	−83	−51	−22	−2	14	41	51	62	87	115
Tiksi, 1947 [4]	Winter	8	30	31	32	43	69	87	92	115	176	182
	Equinox	−30	−31	3	39	58	91	152	217	245	230	145
	Summer	−116	−66	−46	−12	29	73	113	182	223	173	223
	Year	−47	−21	−4	19	43	78	117	163	191	193	183
Uelen, 1937 [5]	Winter	33	32	38	45	54	63	64	80	92	87	53
	Equinox	26	38	51	62	65	91	89	90	88	65	−12
	Summer	−13	26	51	92	124	151	154	121	124	58	26
	Year	14	27	43	62	77	99	99	95	100	69	22
Srednikan, 1948 [6]	Winter	10	7	11	15	16	20	18	13	16	5	11
	Equinox	−31	−26	−20	−8	3	18	24	40	40	36	18
	Summer	−48	−50	−36	−16	0	27	53	47	16	44	34
	Year	−23	−23	−15	−3	6	22	32	33	34	28	21
Yakutsk, 1948 [7]	Winter	15	13	10	12	13	17	19	14	14	8	11
	Equinox	−27	−24	−21	−20	−16	−1	10	29	35	34	34
	Summer	−44	−46	−46	−33	−21	−2	20	42	60	58	54
	Year	−19	−19	−19	−14	−8	5	16	28	36	33	33
Leningrad, 1948 [8]	Winter	−1	8	8	10	12	12	8	1	−4	−8	−9
	Equinox	6	−7	14	8	−11	−17	−20	−21	−28	−32	−21
	Summer	2	4	1	2	−7	−16	−38	−50	−45	−41	−27
	Year	−2	2	9	7	−2	−7	−17	−23	−25	−27	−19
Sverdlovsk, 1948 [9]	Winter	10	14	14	15	13	10	7	2	−1	−4	−4
	Equinox	10	13	16	6	−12	−26	−28	−28	−24	−21	−13
	Summer	17	14	9	−1	−17	−30	−42	−48	−40	−28	−14
	Year	12	14	13	6	−6	−15	−21	−25	−22	−18	−10
Kazan', 1948 [10]	Winter	9	13	13	14	15	14	11	5	2	−4	−5
	Equinox	14	15	18	13	−3	−14	−19	−25	−26	−27	−22
	Summer	15	16	14	7	−6	−18	−32	−42	−39	−34	−26
	Year	12	15	15	12	2	−6	−14	−20	−21	−22	−17
Moscow, 1948 [11]	Winter	11	15	14	16	18	18	15	7	1	−6	−8
	Equinox	16	18	22	17	3	−10	12	−19	27	−34	−28
	Summer	14	17	17	13	1	−11	32	−45	−44	−40	−32
	Year	14	17	18	15	7	−1	−10	−19	−23	−27	−23
Irkutsk, 1948 [12]	Winter	15	14	8	5	2	5	9	6	3	−3	−4
	Equinox	12	−1	−10	−20	−25	−32	−21	−10	−4	−7	−8
	Summer	0	−17	−28	−35	−38	−32	−26	−16	−4	3	14
	Year	9	−1	−10	−16	−20	−20	−13	−7	−2	−2	0
Odessa, 1948 [13]	Winter	15	16	17	19	22	24	18	12	4	0	−2
	Equinox	24	19	18	19	15	6	−1	−6	−14	−17	−17
	Summer	13	16	16	16	8	−2	−18	−28	−28	−23	−19
	Year	17	17	17	18	15	9	0	−8	−12	−13	−12
Vladivostok, 1947 [14]	Winter	8	−2	−6	−4	4	10	10	10	7	−1	−7
	Equinox	3	−6	−6	7	16	22	12	4	[illegible]	−8	−18
	Summer	−20	−26	−22	−11	−6	6	10	17	8	−3	−16
	Year	−3	12	12	−1	5	13	11	10	6	−6	−11
Tbilisi, 1948 [13]	Winter	16	18	20	22	26	23	21	11	8	2	2
	Equinox	21	21	19	18	1	−5	−8	−11	−12	−11	−13
	Summer	15	20	21	16	2	−9	−2	−30	−21	−16	−8
	Year	17	26	20	19	11	1	−1	[illegible]	−8	[illegible]	[illegible]
Tashkent, 1948 [14]	Winter	16	20	26	21	21	20	11	10	8	2	−2
	Equinox	22	21	20	12	−4	−15	20	11	10	12	−15
	Summer	22	21	16	6	−7	−16	−21	2	11	−13	−9
	Year	20	21	19	11	4	−1	−20	10	−7	−8	−9

	11	12	13	14	15	16	17	18	19	20	21	22	23	amplitude
[1]	28	−34	−32	−70	−22	8	0	5	23	2	10	19	7	99
	−36	−42	−59	−38	−8	17	26	36	7	18	12	26	11	79
	−7	−17	−16	−6	−8	−16	−22	−2	10	13	−6	1	8	67
	−24	−31	−36	−38	−13	3	2	13	12	11	5	15	10	46
[2]	135	118	71	33	25	−27	−79	−75	113	−135	146	−119	−89	281
	124	107	45	−3	24	−75	−151	−80	−117	−135	−106	8	−18	275
	108	79	45	17	18	3	−53	−74	−105	−110	−116	146	−108	254
	170	171	124	55	31	−3	−33	−72	−108	−160	−155	154	−140	331
[3]	114	120	97	48	51	−12	−112	−62	−91	−128	120	−81	−48	249
	102	118	104	91	57	33	25	−55	−102	−91	103	−141	111	262
	174	182	165	113	81	52	13	−44	−79	142	−148	−147	153	337
	130	140	122	84	62	24	−42	−54	−91	−122	−128	−124	−105	268
[4]	166	101	5	11	82	−119	−169	171	−176	−172	−146	−77	7	358
	108	168	22	−23	−72	−132	170	212	−200	−217	−192	−108	−33	462
	147	75	31	11	−19	−61	−124	138	−140	−172	−150	119	−115	395
	140	95	20	18	−57	−104	−154	−174	−172	187	−163	99	46	381
[5]	−18	−26	−68	−122	−80	−68	86	−99	−74	−28	−10	17	27	214
	−56	−71	−121	−122	−101	−91	−51	−26	−17	−21	−5	21	21	213
	−2	−44	−74	−103	−131	−132	−92	79	−60	−54	−43	−27	−16	285
	−25	47	−88	−115	−104	−96	−75	−68	−49	−33	19	−1	14	215
[6]	5	−4	1	−17	−31	−52	37	−24	2	−2	9	8	4	72
	12	0	−6	4	−16	9	−20	−20	6	−6	1	−5	−20	71
	32	24	12	19	4	−2	8	−14	29	−21	−20	45	−53	106
	16	6	2	2	−14	−21	22	19	−12	−10	−3	14	−23	57
[7]	11	6	3	−9	−23	−40	42	−37	24	8	2	7	7	64
	14	11	6	7	−3	−6	−11	−20	−14	−9	0	−1	−10	62
	41	31	24	21	13	10	0	−11	−21	−30	−31	−42	−49	109
	23	16	11	6	4	−12	−18	−23	−20	−16	−11	−12	17	59
[8]	−8	−1	2	5	5	9	0	−8	−6	−8	13	−10	−9	25
	−9	0	26	18	20	22	18	21	9	10	2	6	−4	58
	−14	−7	23	38	40	36	36	30	27	11	−6	−2	−12	90
	−10	2	17	20	22	23	18	14	10	4	−5	−2	−8	50
[9]	−3	−3	−5	−11	−14	9	−7	−12	−10	2	2	−4	2	29
	−7	−3	8	6	9	10	14	12	14	18	12	10	9	16
	−2	11	17	20	19	20	23	18	20	13	8	8	6	71
	−4	2	7	5	5	7	10	6	8	11	6	5	5	39
[10]	−5	−5	−6	−12	−15	−12	−11	−12	−7	2	1	−3	1	30
	15	−10	4	2	6	7	12	11	13	17	12	10	10	45
	−13	−1	10	16	15	18	20	18	22	16	9	9	8	64
	−11	−5	3	2	2	4	7	6	9	12	7	5	5	37
[11]	8	−7	−8	−11	16	−16	−14	−14	−7	2	2	−2	−2	34
	23	−16	0	−1	3	5	12	10	12	17	11	12	10	56
	22	−9	4	13	16	17	22	21	26	19	10	10	7	71
	−18	−11	−1	0	1	2	7	6	10	12	8	7	5	45
[12]	−7	−6	−5	−9	11	−6	−8	−11	9	2	3	2	2	26
	−12	−5	6	6	9	11	18	13	16	17	16	16	12	50
	13	12	16	17	16	19	20	14	14	12	15	10	3	58
	−2	0	6	1	5	8	10	6	7	10	11	9	6	31
[13]	−4	−12	−10	−15	−26	−23	−20	−20	−13	−3	1	−2	−1	50
	−18	−17	−14	−15	−14	−11	−1	1	4	8	10	11	9	42
	−13	9	−5	−3	−4	0	8	11	16	14	10	10	8	44
	−12	12	−10	−11	−14	−11	−4	−3	2	6	7	7	6	32
[14]	−8	−16	−14	8	−12	−5	4	5	7	4	10	6	1	28
	−17	−15	−9	−1	2	0	2	11	6	9	2	−5	15	30
	6	1	10	8	10	10	11	17	15	14	6	−10	27	44
	10	−10	4	−1	0	2	9	11	9	11	6	−3	−15	28
[15]	6	−14	16	22	28	[illegible]	−22	22	17	−1	1	−2		55
	12	16	11	15	−12	7	4	5	8	14	10	11	12	39
	5	5	5	[illegible]	10	1	8	4	11	15	8	9	8	51
	30	−12	−12	15	−15	11	−7	[illegible]	2	8	6	6	5	37
[16]	7	13	14	[illegible]	21	[illegible]	15	−18	16	5	1	−2	−2	18
	5	21	−11	10	1	1	8	10	12	18	13	12	12	[illegible]
	9	7	[illegible]	5	[illegible]	[illegible]	10	[illegible]	14	15	10	10	[illegible]	18
	13	14	10	12	10	[illegible]	9	−2	3	9	5	7	[illegible]	[illegible]

TABLE 30

SOLAR-DAILY GEOMAGNETIC VARIATIONS OF VERTICAL COMPONENT (Z) FOR DISTURBED DAYS (IN GAMMAS) YEAR OF LOW MAGNETIC ACTIVITY

Observatory and observation year	World time	1	2	3	4	5	6	7	8	9	10
Bukhta Tikhaya, 1944 [1]	Winter	73	52	40	12	−10	−35	−58	−105	−129	−141
	Equinox	86	81	75	37	21	−8	61	−113	−130	−146
	Summer	84	92	75	65	44	28	1	−29	−73	−111
	Year	81	74	62	38	18	6	29	−83	−111	13[illegible]
Mys Chelyuskin, 1944 [2]	Winter	−23	−48	−81	−10	−41	−40	−45	−63	−86	−102
	Equinox	29	−4	−16	−41	−43	−33	59	−80	100	87
	Summer	49	−11	1	0	2	7	−26	62	101	−131
	Year	20	−23	−22	26	−27	27	43	−68	−96	−107
Dikson, 1944 [3]	Winter	−3	−18	10	−5	2	10	9	16	8	−5
	Equinox	24	−2	−16	−18	−4	3	12	9	5	21
	Summer	7	2	8	16	4	6	13	20	20	[illegible]
	Year	9	−6	−6	−2	1	6	12	15	8	−7
Matochkin Shar, 1944 [4]	Winter	67	46	17	3	13	22	32	38	31	23
	Equinox	100	49	6	−25	−19	−24	−1	15	2	−20
	Summer	54	45	28	24	1	8	10	23	25	27
	Year	60	32	17	2	1	2	17	26	21	[illegible]
Tiksi, 1944 [5]	Winter	−19	−2	6	10	19	15	9	15	10	−7
	Equinox	−2	5	15	33	24	21	19	9	12	[illegible]
	Summer	15	18	21	23	21	22	17	28	22	15
	Year	0	8	15	23	22	19	16	17	15	7
Uelen, 1943 [6]	Winter	48	55	60	69	74	81	80	55	48	24
	Equinox	40	50	62	64	79	68	62	46	7	−19
	Summer	37	49	72	77	68	70	71	62	51	8
	Year	43	54	67	72	75	75	72	62	36	[illegible]
Sverdlovsk, 1944 [7]	Winter	−9	−8	7	−5	−1	−3	2	−2	0	2
	Equinox	−16	−14	−10	−8	−5	−4	−5	−4	1	6
	Summer	4	−4	−5	−6	−6	−7	−7	−7	−5	1
	Year	−9	−9	7	−6	−5	−5	−5	−1	−2	3
Kazan', 1944 [8]	Winter	−11	−10	−9	8	−6	−6	−5	−4	−4	−2
	Equinox	−14	−13	−10	−8	−4	−3	−4	−4	3	0
	Summer	−4	−5	−5	−6	−5	−4	−6	−6	−6	−4
	Year	−10	−9	−8	−7	−5	−5	−5	−5	−4	−2
Irkutsk, 1944 [9]	Winter	−2	−2	−2	−1	0	0	0	2	2	4
	Equinox	−6	−5	−6	−8	−8	−8	−7	−2	3	9
	Summer	−2	−5	−8	−10	−10	−8	−6	−3	2	[illegible]
	Year	−4	−4	−5	−6	−6	−6	4	−1	2	7
Vladivostok, 1944 [10]	Winter	−3	−8	−9	−8	−6	−5	−3	0	0	[illegible]
	Equinox	−7	−11	13	12	−11	−8	−5	−1	2	[illegible]
	Summer	6	−9	−11	−10	−9	−7	−1	−1	1	3
	Year										
Tbilisi, 1944 [11]	Winter	−5	−1	−4	−4	−4	−5	6	−7	−8	8
	Equinox	−3	−3	−2	0	3	2	−5	−9	−10	[illegible]
	Summer	1	2	3	3	2	2	−1	−8	−10	−10
	Year	−2	−1	−1	0	1	0	−5	−8	−9	−9
Tashkent, 1944 [12]	Winter	−3	−2	−2	−2	−3	−4	1	−2	−2	−1
	Equinox	−4	−2	0	0	−3	−7	−9	−10	−7	[illegible]
	Summer	3	4	3	0	−5	−10	−13	−12	−9	−5
	Year	−1	0	0	−1	−4	−7	−9	−8	−6	[illegible]

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	11	12	13	14	15	16	17	18	19	20	21	22	23		[illegible]
[1]	144	−126	95	−38	−2	31	97	103	69	88	75	81	58	3	74
	−145	−140	−109	75	−70	12	31	78	116	127	104	74	63	84	97
	130	−141	−132	−112	−80	−41	20	46	43	75	66	75	77	86	223
	−140	−136	−112	−75	−50	1	50	75	87	91	82	78	69	87	231
[2]	−114	−101	−46	−3	2	27	117	183	113	116	101	90	59	19	297
	116	−112	−144	−89	31	−73	64	124	143	161	136	84	101	32	305
	−136	120	−106	−70	−17	11	76	80	98	100	123	105	87	51	259
	−121	−110	−100	−52	−9	38	85	129	117	125	119	96	84	21	250
[3]	−25	−34	−104	−143	−145	−78	−25	39	77	119	135	111	72	1	280
	50	−75	−89	−96	−101	−101	−24	54	97	104	97	98	81	23	205
	0	−30	−46	−57	61	50	−38	−4	20	30	45	46	33	7	103
	−25	−47	−77	−99	−102	76	29	29	6[illegible]	84	92	87	62	9	191
[4]	6	−9	−86	157	−145	115	−106	−96	3	61	100	110	72	71	26[illegible]
	29	−58	−68	93	−102	152	−94	−56	20	63	108	132	149	100	292
	10	−21	34	50	−76	−81	−101	−63	−27	6	17	59	67	61	16[illegible]
	−3	28	−64	−101	−107	116	−101	−72	−1	42	74	100	93	76	216
[5]	−19	−16	−38	−20	9	17	83	53	−33	−1	−21	29	−30	10	121
	−22	−42	−15	5	2	60	18	32	−1	−39	61	46	−27	[illegible]	121
	23	0	10	−5	12	−4	11	10	40	60	51	49	−27	−10	88
	5	−20	−12	−5	7	35	33	22	−24	−36	−47	−42	−28	8	80
[6]	−30	−91	−72	−100	−94	−76	−57	−68	−49	34	12	5	23	40	181
	−50	−60	−67	−58	−35	−94	−67	−43	−35	22	−11	11	29	39	173
	−52	−56	−32	−41	−77	−100	−102	−57	−49	31	20	4	18	36	179
	44	−69	−57	−68	−69	−91	−76	−57	−46	30	−16	5	21	36	166
[7]	6	7	12	16	22	21	6	0	−3	−6	−10	−12	12	−12	31
	15	20	18	15	13	10	8	2	−2	−6	−8	−8	−10	−11	36
	1	12	15	11	12	9	6	2	1	0	−3	−5	6	−6	22
	8	13	15	15	15	13	7	2	−1	−4	−7	−8	−9	−10	25
[8]	2	4	8	15	25	25	11	7	2	−1	−7	−10	−11	10	36
	7	13	16	14	13	12	10	6	2	1	−4	−4	−7	9	30
	0	6	10	12	12	10	8	5	3	2	0	4	−4	−5	18
	3	8	11	14	16	16	10	6	2	0	4	−6	−7	−8	26
[9]	5	6	7	6	1	3	−4	−5	−4	−4	−4	−3	−3	−2	12
	14	12	9	8	6	3	2	0	−2	−4	−1	−4	−4	−2	22
	9	9	9	7	6	4	2	1	1	1	1	1	1	−1	19
	9	9	8	7	5	3	0	−1	2	2	−2	2	−2	−2	15
[10]	3	4	4	5	5	5	5	4	3	2	2	3	2	−1	14
	5	6	6	6	6	6	6	6	5	6	6	5	2	0	19
	4	5	5	5	6	5	5	4	4	4	4	3	2	0	17
[11]	−5	−2	3	5	9	10	8	7	8	5	4	1	1	−1	18
	−5	0	4	4	5	4	5	4	4	3	3	2	0	0	16
	−8	5	−2	1	1	4	4	4	4	4	4	4	3	3	14
	−6	−2	1	3	6	6	5	5	5	4	4	2	1	1	15
[12]	0	0	0	2	4	5	5	4	2	3	2	1	1	0	9
	1	4	4	1	4	5	4	5	4	3	2	2	0	0	15
	−2	1	4	1	4	4	4	4	4	4	4	2	3	3	17
	0	2	3	3	4	5	1	4	3	3	2	2	1	1	14

TABLE 31

SOLAR-DAILY VARIATIONS OF VERTICAL COMPONENT (Z) FOR DISTURBED DAYS (IN GAMMAS) YEAR OF HIGH MAGNETIC ACTIVITY

Observatory and observation year	World time	1	2	3	4	5	6	7	8	9	10
Bukhta Tikhaya, 1937 [1]	Winter	42	42	51	43	7	-14	-40	-65	-68	-88
	Equinox	112	93	65	39	24	6	-26	-45	-67	-72
	Summer	130	164	153	115	76	42	7	-56	-85	-110
	Year	96	101	91	67	37	12	-19	-55	-72	-103
Dikson, 1937 [2]	Winter	17	11	9	8	14	20	21	19	18	15
	Equinox	69	82	44	33	11	-4	-14	-21	-31	-39
	Summer	67	56	25	10	16	6	-2	-10	-30	59
	Year	51	48	26	17	14	7	1	-4	15	-28
Matochkin Shar, 1937 [3]	Winter	50	23	22	10	5	6	17	21	20	20
	Equinox	97	100	82	62	46	17	12	2	-21	-33
	Summer	109	102	66	55	49	30	30	21	4	-24
	Year	83	73	56	41	32	17	19	13	2	-13
Tiksi, 1947 [4]	Winter	-46	-22	-15	[illegible]	7	2	3	-6	-6	-34
	Equinox	-19	7	3	-5	6	4	-4	-57	-133	-191
	Summer	4	24	25	32	60	36	45	4	-68	-60
	Year	-19	4	5	8	25	15	16	-19	-69	-95
Uelen, 1937 [5]	Winter	18	24	30	34	38	45	40	40	38	31
	Equinox	16	22	24	24	22	14	26	18	17	-4
	Summer	19	28	36	39	49	46	38	23	6	4
	Year	18	25	30	32	36	35	34	27	20	11
Srednikan, 1948 [6]	Winter	10	14	16	18	20	21	23	29	36	39
	Equinox	-11	0	9	12	20	39	45	56	62	62
	Summer	-18	-15	-10	-4	6	19	42	60	56	47
	Year	-7	0	5	9	15	26	37	48	51	49
Yakutsk, 1948 [7]	Winter	2	7	8	10	11	12	14	18	22	28
	Equinox	-19	-5	2	4	7	18	27	35	45	52
	Summer	-13	-11	-9	-7	-3	6	19	39	43	46
	Year	-10	-3	0	2	5	12	20	30	37	42
Leningrad, 1948 [8]	Winter	-37	-31	-28	-23	-19	-16	-12	-8	-1	0
	Equinox	-73	-70	-46	-41	-35	-23	-10	-4	7	16
	Summer	-33	-36	-37	-28	-21	-15	-6	-1	1	6
	Year	-48	-46	-37	-30	-25	-18	-9	-4	1	7
Sverdlovsk, 1948 [9]	Winter	-13	-11	-9	-7	-6	-6	-7	-7	-6	-1
	Equinox	-28	-25	-19	-12	-8	-5	-5	-6	-2	6
	Summer	-16	-16	-16	-12	-10	-11	-11	-10	7	3
	Year	-19	-17	-15	-10	-8	-7	-8	-8	-5	3
Kazan', 1948 [10]	Winter	-14	-12	-10	-8	-6	-7	-8	-8	-6	-5
	Equinox	-26	-26	-20	-15	-10	-6	-7	-7	-5	1
	Summer	-13	-13	-14	-12	-11	-11	-11	-11	-11	-4
	Year	-18	-17	-15	-12	-9	-8	-8	-9	-8	-3
Moscow, 1948 [11]	Winter	-17	-16	-14	-12	-11	-10	-10	-9	-7	-6
	Equinox	-31	-33	-25	-20	-12	-8	-5	-6	-7	-4
	Summer	-15	-16	16	-14	-10	-10	-8	-10	-13	-13
	Year	-21	-22	-19	-15	-11	-9	-8	-8	-9	-8
Irkutsk, 1948 [12]	Winter	-4	-3	-3	-4	-4	-4	-3	-2	0	4
	Equinox	-9	-7	-7	-10	-12	-10	-6	-2	5	11
	Summer	-11	-12	-14	-16	-18	-16	-12	-5	5	14
	Year	-8	-7	-8	-10	-11	-10	-7	-3	4	10
Odessa, 1948 [13]	Winter	-4	-5	-4	-4	-4	-4	-5	-8	-9	-8
	Equinox	-6	-8	-6	-6	-4	-2	2	-6	-9	-10
	Summer	-1	-1	-1	0	-2	-4	-5	-7	-10	-12
	Year	-4	-4	-4	-3	-3	-3	-4	-7	-9	-10
Tbilisi, 1948 [14]	Winter	-4	-4	-4	-4	-4	-3	-4	-6	-7	-6
	Equinox	-2	-3	-3	0	3	1	-4	-9	-12	-12
	Summer	2	2	4	4	3	-1	-9	-13	-18	-18
	Year	-1	-2	-1	0	1	-1	-6	-10	-12	-12
Tashkent, 1948 [15]	Winter	-2	-2	-2	0	-2	-5	-7	-8	-6	-5
	Equinox	-3	0	2	1	-4	-10	-13	-12	-10	-6
	Summer	6	8	6	2	-5	-12	-20	-21	-18	-13
	Year	1	2	2	1	-4	-9	-13	-14	-12	-8

	11	12	13	14	15	16	17	18	19	20	21	22	23		Amplitude
[1]	-93	-84	-83	-48	-10	-16	3	61	57	47	72	70	68	44	165
	-101	-119	-107	-69	-56	-40	-30	-13	28	42	66	70	89	116	235
	-134	-143	-151	-150	-105	-78	-73	-40	6	30	80	95	115	134	215
	-109	-115	-115	-89	-57	-46	-34	2	29	39	71	77	89	97	216
[2]	-29	-67	-100	-109	-96	-90	-49	7	59	95	83	61	65	22	204
	-81	-92	-129	-141	-111	-75	-46	14	33	82	81	116	119	71	260
	-94	-111	-118	-111	-74	-60	-30	4	42	88	121	114	86	65	239
	-68	-90	-116	-120	-93	-75	-41	9	54	88	95	97	92	53	217
[3]	-4	-27	-55	-101	-137	-105	-98	-55	22	56	55	95	103	54	240
	-68	-74	-103	-150	-150	-123	-92	-37	16	38	71	92	100	101	251
	68	-109	-124	-126	-131	-103	-83	-54	-25	34	63	87	98	108	241
	-47	-71	93	-125	-138	109	-89	-47	6	45	64	92	102	90	210
[4]	-41	-45	-63	-9	-5	74	91	76	39	15	13	29	3	-46	154
	-164	-137	-60	-38	32	91	99	100	142	75	131	51	22	-18	351
	-56	-41	-38	9	14	21	17	35	26	0	-28	-35	-24	7	128
	-88	-75	-53	-13	13	62	69	89	69	29	38	15	-3	20	184
[5]	6	-24	-6	3	-26	-24	-11	-30	-74	-76	-57	-28	-2	17	121
	-4	10	12	10	2	-14	-49	-55	-20	-16	-21	-18	-2	10	81
	0	4	1	-11	-22	-37	-41	-57	-59	-47	-30	-13	6	23	108
	0	-10	2	0	-15	-25	-34	-47	-51	-46	-36	-20	0	17	87
[6]	41	43	20	8	-20	-44	-70	-67	-52	-36	-30	-20	-8	4	113
	55	22	0	-26	-22	-37	-44	-48	-51	-48	-38	-31	-17	-7	113
	46	38	13	3	-10	-29	-32	-32	-34	-38	-30	-29	-24	-18	98
	48	34	11	5	-18	-37	-49	-49	-46	-41	-32	-27	16	-7	100
[7]	29	34	30	22	1	-20	35	-41	-40	-32	-30	-26	-14	-5	75
	56	49	29	3	4	-22	-32	-42	-47	-51	-41	-33	-20	-14	107
	47	43	28	2	-1	-16	-18	-22	-30	-34	-29	-33	-27	-19	81
	44	42	29	9	0	-19	-28	-35	-39	-39	-33	-31	-20	-12	83
[8]	5	9	17	26	36	52	55	40	30	13	-11	-33	-36	-33	92
	24	40	44	55	54	52	49	35	11	-1	-9	20	-22	-28	128
	13	19	26	31	32	45	43	31	22	3	-6	23	-25	-39	84
	14	22	29	37	41	50	49	36	22	5	-9	-25	-27	-33	98
[9]	4	7	12	16	22	24	18	11	6	0	-9	11	-12	10	38
	14	28	32	30	24	21	15	5	-2	-8	-14	-15	11	-12	60
	12	23	28	27	24	20	14	6	2	-5	-8	-15	-12	-14	41
	10	20	24	25	23	22	16	8	2	-4	10	-15	-12	-12	44
[10]	0	5	12	15	20	24	21	14	10	3	-5	-12	-12	-10	38
	10	21	26	31	26	23	17	10	3	-3	-8	-11	-9	-11	57
	4	12	20	26	26	24	18	10	5	0	-6	-11	-9	-13	40
	1	13	19	24	24	24	18	11	6	0	-6	-12	-10	-11	42
[11]	-5	0	8	13	18	26	26	24	19	10	0	-8	-10	-10	13
	2	14	22	31	31	28	23	15	10	2	-4	-7	-8	-11	-61
	-6	2	12	23	28	31	25	18	12	5	-1	-7	-7	-13	47
	-3	5	14	22	26	28	25	19	14	6	-2	-8	-8	-12	50
[12]	4	6	9	10	8	6	2	-1	-2	-1	-4	-6	-5	-4	16
	15	17	16	12	8	7	4	1	-4	-6	8	-8	-5	-4	29
	21	22	17	12	9	7	1	3	1	0	-2	-2	-4	4	10
	13	15	14	11	8	7	3	1	-2	-2	-4	-5	-5	-4	26
[13]	-6	-4	0	3	5	7	10	11	10	9	6	4	2	1	20
	-9	-5	1	7	10	11	11	10	8	7	5	1	3	2	21
	-11	-9	-5	2	7	10	12	10	9	8	6	1	4	2	24
	-9	-6	-2	4	7	9	11	10	9	8	6	4	3	2	21
[14]	-5	-2	2	3	4	6	7	7	7	6	3	2	0	0	14
	-8	-3	2	6	8	7	7	6	6	4	3	2	2	2	20
	-15	-11	-5	2	8	9	7	7	8	7	7	6	6	5	27
	-9	-5	0	4	7	8	7	7	7	6	4	3	3	2	20
[15]	-2	-2	0	2	4	6	6	6	5	6	5	2	1	0	14
	-2	2	5	6	6	6	6	7	5	4	3	1	1	2	20
	-6	0	7	8	6	7	8	7	6	6	5	5	4	5	29
	-3	0	4	6	5	6	7	7	5	5	4	3	2	2	21

TABLE 32

SOLAR-DAILY GEOMAGNETIC VARIATIONS OF TOTAL INTENSITY (F) FOR QUIET DAYS (IN GAMMAS AVERAGES FOR 11 YEARS. YEAR OF HIGH MAGNETIC ACTIVITY

Observatory	World time	1	2	3	4	5	6	7	8	9	10
Bukhta Tikhaya [1]	Winter	24	17	7	−4	−8	−8	−6	−6	−7	−12
	Equinox	30	21	9	−1	−9	−6	−3	0	1	0
	Summer	42	31	15	−1	−3	−1	9	12	13	8
	Year	32	23	10	−2	−7	−5	0	2	2	7
Mys Chelynskin [2]	Winter	22	−23	−19	−14	−10	−7	−3	−1	1	0
	Equinox	−22	−21	−16	−12	−8	−4	−1	−1	1	1
	Summer	−22	−23	−19	−14	−9	−5	0	2	4	3
	Year	−22	22	−18	−13	−9	−5	−1	0	2	1
Dikson [3]	Winter	−7	7	−5	−4	−2	1	1	2	2	5
	Equinox	−6	−5	4	−3	−2	0	0	1	2	1
	Summer	−10	−9	−7	6	−3	−1	−1	1	5	8
	Year	−8	−7	−5	−4	2	0	0	1	3	6
Matochkin Shar [4]	Winter	−1	−2	5	−5	−5	−5	−3	−2	1	5
	Equinox	3	2	1	−3	−3	−7	7	−4	−4	0
	Summer	9	2	[illegible]	−8	−11	−11	12	−9	−6	0
	Year	4	0	−4	−5	−6	−8	−7	−5	−3	2
Tiksi [5]	Winter	−4	1	6	10	11	11	8	9	8	9
	Equinox	0	6	14	19	20	18	14	10	8	7
	Summer	4	14	18	20	18	14	12	10	8	5
	Year	0	7	13	16	16	14	11	10	8	7
Uelen [6]	Winter	0	2	4	4	5	6	7	9	11	12
	Equinox	−1	1	2	4	6	8	8	9	10	10
	Summer	−7	[illegible]	0	1	8	12	12	12	11	10
	Year	−2	0	2	4	6	8	9	10	11	11
Leningrad [7]	Winter	−1	0	0	1	1	0	−1	−3	−4	−4
	Equinox	1	1	2	3	3	2	1	−7	−11	−12
	Summer	2	4	4	4	1	−1	−5	−10	−15	−17
	Year	1	2	2	3	2	0	−2	−7	−10	−11
Sverdlovsk [8]	Winter	−1	0	1	1	1	−1	−3	−4	−4	−2
	Equinox	1	3	4	5	3	−2	−8	−13	−13	−10
	Summer	6	6	1	1	−3	−9	−13	−17	−16	−11
	Year	3	3	3	2	0	−4	−8	−11	−11	−8
Kazan' [9]	Winter	−1	1	0	0	1	0	−2	−4	−5	−4
	Equinox	1	2	3	4	4	1	5	−11	−15	−13
	Summer	5	6	6	3	−1	−5	−10	−14	−16	−16
	Year	2	2	3	2	1	−1	−6	−10	−12	−11
Irkutsk [10]	Winter	1	1	−2	−4	−4	−4	−2	0	1	1
	Equinox	3	0	−6	−11	−14	−13	−9	−3	1	4
	Summer	−1	−7	−13	−18	−19	−15	−10	−3	1	5
	Year	1	−2	−8	−11	−8	−11	−6	0	1	3
Tbilisi [11]	Winter	−2	−2	−1	0	2	2	0	−3	−5	−4
	Equinox	2	2	3	5	6	2	−7	−13	−14	−12
	Summer	4	6	9	8	4	−4	−12	−15	−14	−11
	Year	1	2	4	4	3	0	−7	−10	−11	−10
Tashkent [12]	Winter	−1	1	2	4	2	−3	−5	−4	−2	0
	Equinox	2	4	6	4	−4	−12	−16	−13	−8	−2
	Summer	8	9	5	−1	−9	−16	−18	−15	−9	−4
	Year	3	5	4	2	−4	−10	−13	−11	−6	2
Vladivostok [13]	Summer	−16	−18	−16	−12	−8	−3	0	3	4	4

	11	12	13	14	15	16	17	18	19	20	21	22	23		Amplitude
[1]	−14	−20	−23	−24	−23	−17	−8	4	14	23	27	23	23	20	51
	−4	−11	−19	−26	−27	−22	−12	0	10	12	8	11	19	21	57
	−1	−9	−28	−45	−49	−44	−38	−23	−6	9	18	22	29	36	91
	−6	−13	−23	−32	−33	−28	−19	−6	6	15	18	19	24	26	65
[2]	−1	−6	−13	−15	−15	−1	11	26	30	28	31	20	9	−6	54
	−1	−7	−15	−19	−14	−21	13	28	28	24	32	20	10	−4	54
	7	−6	−16	−22	−21	−12	6	24	37	38	35	21	9	−9	61
	2	−1	−14	−19	−17	−11	−5	26	32	30	33	20	9	−6	55
[3]	6	9	9	9	4	0	−8	−10	−4	0	3	2	−3	−4	19
	7	8	10	9	4	−4	−6	−5	−1	1	5	1	3	−8	18
	12	13	15	16	11	5	0	−2	−4	−5	−7	−6	−12	−15	31
	8	10	11	11	6	0	−5	−6	−3	−1	0	−1	−4	−9	20
[4]	8	10	10	9	10	4	−2	−9	−9	−11	−8	1	−1	5	21
	3	7	12	14	12	7	1	−6	−11	−7	0	−2	−1	1	25
	5	12	16	19	19	15	5	−5	−12	−13	−9	−6	−1	1	32
	5	10	13	14	14	9	1	−7	−11	−10	−6	−2	−1	2	25
[5]	11	12	12	10	6	−2	−11	−18	−17	−16	−15	−14	−12	−10	30
	5	7	8	6	1	−7	−16	−18	−19	−21	−18	−16	−14	−12	41
	4	6	9	7	4	−2	−11	−18	−17	−16	−15	−14	−12	−10	38
	7	8	10	8	4	−4	−13	−18	−18	−18	−16	−15	−13	−11	34
[6]	10	4	−5	−7	−7	−7	−10	−10	−5	−5	−5	−5	−4	−3	22
	10	4	−2	−6	−8	−10	−9	−6	−5	−5	−6	−6	−7	−6	20
	9	5	2	−2	−3	−2	−2	−2	−3	−7	−10	−12	−14	−14	26
	10	4	−2	−5	−5	6	−7	−6	−4	−6	−7	−6	−8	−8	19
[7]	−3	0	2	2	2	2	2	3	2	2	1	0	0	0	7
	−10	−5	0	3	4	4	4	5	5	5	4	3	1	1	17
	−14	−8	−1	3	6	7	7	7	7	6	4	4	2	2	24
	−9	−4	0	3	4	4	4	5	5	4	3	2	1	1	16
[8]	0	1	1	1	1	2	2	2	2	1	1	0	−1	−1	6
	−4	0	3	3	3	3	4	4	4	4	3	2	2	2	18
	−6	1	5	6	6	5	5	5	5	5	4	4	4	5	23
	−3	1	3	3	3	3	4	4	4	3	3	2	2	2	15
[9]	−2	0	1	2	2	2	2	2	3	2	1	0	0	−1	8
	−9	−3	1	3	3	3	4	4	5	4	4	3	2	2	20
	−11	−4	2	5	6	5	5	5	5	5	4	4	4	4	22
	−7	−2	1	2	4	3	4	4	4	4	3	2	2	2	16
[10]	0	0	0	1	1	1	1	1	1	1	0	0	0	0	5
	4	2	3	3	3	4	4	4	3	3	3	3	3	4	18
	8	7	5	5	5	5	5	5	5	5	5	7	7	5	27
	3	2	3	3	3	3	3	3	3	3	3	3	3	3	14
[11]	−2	0	1	1	2	2	1	2	2	2	2	1	0	0	7
	−7	−2	0	1	1	1	3	4	4	5	4	5	4	4	20
	−8	−5	−2	1	2	2	2	4	5	5	6	5	5	5	24
	−6	−2	−1	1	2	2	2	3	4	4	4	4	3	3	15
[12]	1	0	0	0	0	0	1	1	1	1	1	1	1	1	9
	2	3	2	1	1	2	3	4	4	4	4	4	4	4	22
	−1	3	4	3	2	3	3	4	5	5	4	4	4	6	27
	1	3	2	1	1	2	2	3	3	3	3	3	3	4	18
[13]	4	4	5	5	5	6	6	6	6	6	8	7	2	−4	26

TABLE 33

SOLAR-DAILY GEOMAGNETIC VARIATIONS OF TOTAL INTENSITY F FOR QUIET DAYS (IN GAMMAS) YEAR OF LOW MAGNETIC ACTIVITY

Observatory and observation year	World time	1	2	3	4	5	6	7	8	9	10
Bukhta Tikhaya 1944 [1]	Winter	21	17	9	−9	−14	−11	−7	−4	−2	−3
	Equinox	21	20	7	−11	−17	−12	−4	−1	1	−1
	Summer	34	32	−3	−11	−12	−9	5	8	12	17
	Year	25	19	4	−10	−14	−10	−2	1	3	4
Mys Chelyuskin 1944 [2]	Winter	−15	−17	−13	−6	−3	3	5	5	10	8
	Equinox	−22	−19	−13	−7	−3	3	−1	−1	2	4
	Summer	−25	−22	−18	−14	−10	−7	−2	0	4	6
	Year	−20	−18	−14	−10	−4	−1	4	3	7	7
Dikson, 1944 [3]	Winter	−6	−5	−3	−2	0	0	0	−2	−1	1
	Equinox	−10	−8	−6	−2	−2	−2	−1	0	2	5
	Summer	−11	−9	−8	8	−4	−6	−3	−3	2	3
	Year	−6	−5	−4	0	−1	−1	0	−1	1	4
Matochkin Shar 1944 [4]	Winter	−3	−2	−2	−4	−5	−5	−4	0	1	5
	Equinox	−5	−1	−4	−5	−7	−8	−7	−2	−2	0
	Summer	1	−1	0	−1	−5	−6	−8	−6	−5	−3
	Year	−2	−1	−2	−4	−6	−6	−6	−3	−2	1
Tiksi, 1944 [5]	Winter	1	5	5	4	2	2	2	3	2	2
	Equinox	−1	2	8	8	9	6	4	2	3	4
	Summer	5	5	8	8	8	6	3	1	1	0
	Year	1	4	7	7	7	6	4	2	2	2
Uelen, 1943 [6]	Winter	0	3	4	5	6	6	6	7	8	10
	Equinox	1	5	7	7	9	9	9	10	12	13
	Summer	−6	−3	1	5	8	13	12	12	10	8
	Year	−2	2	4	6	8	9	9	10	10	10
Leningrad, 1933 [7]	Winter	−1	0	0	−1	0	1	0	−2	−2	−3
	Equinox	−1	0	1	2	2	0	−1	−6	−9	−11
	Summer	2	3	5	4	2	1	−6	−9	−14	−16
	Year	0	1	2	2	2	1	−2	−6	−9	−10
Sverdlovsk, 1944 [8]	Winter	−2	−2	−1	0	−1	−1	−1	−2	−1	0
	Equinox	1	1	3	3	1	−2	−7	−10	−10	−7
	Summer	4	4	2	1	−2	−7	−11	−13	−12	−8
	Year	1	1	2	2	0	−3	−6	−8	−8	−5
Kazan', 1944 [9]	Winter	−2	−2	−2	−1	0	−1	−2	−2	−2	−1
	Equinox	0	1	1	2	2	1	−3	−8	−10	−10
	Summer	4	4	3	1	−2	−4	−9	−10	−9	−10
	Year	0	1	1	1	0	−2	−4	−7	−8	−7
Irkutsk, 1944 [10]	Winter	0	0	−2	−2	−2	0	2	4	2	1
	Equinox	1	−2	−6	−10	−10	−10	−5	−2	2	3
	Summer	−2	−7	−11	−13	−14	−12	−7	−1	1	4
	Year	0	−2	−6	−8	−9	−7	−4	0	2	2
Vladivostok, 1944 [11]	Winter										
	Equinox	−12	−18	−18	−13	−7	−1	3	6	4	1
	Summer	−17	−18	−16	−11	−7	−2	2	4	4	3
	Year	−11	−15	−16	−11	−6	−1	−3	5	4	2
Tbilisi, 1944 [12]	Winter	−2	−2	−1	0	1	2	0	−3	−2	−1
	Equinox	1	1	3	4	2	−1	−9	−11	−10	−6
	Summer	3	4	7	6	1	−3	−10	−12	−11	−9
	Year	1	1	3	4	1	−1	−6	−9	−8	−6
Tashkent, 1944 [13]	Winter	−1	0	0	1	−1	−4	−4	−2	2	3
	Equinox	2	4	4	2	−4	−11	−12	−9	−4	−2
	Summer	5	7	4	2	−10	−14	−16	−11	−6	−3
	Year	2	3	3	0	−4	−9	−10	−7	−3	−1

	11	12	13	14	15	16	17	18	19	20	21	22	23	
[1]	—9	—17	—24	—27	—26	—19	—9	3	14	16	32	30	20	20	59
	0	—8	—18	—18	—21	—15	—8	0	6	9	12	14	20	21	42
	13	—2	—24	—38	—45	—44	—37	—15	7	17	28	20	24	35	80
	0	—9	—22	—28	—30	—26	—18	—3	8	14	24	22	21	25	55
[2]	8	0	—10	—11	—21	—18	—7	22	21	13	30	10	—3	—14	51
	6	—1	—8	—15	—13	—8	7	19	15	19	13	9	—10	—21	41
	8	—3	—17	—23	—25	—9	16	26	40	38	32	15	7	—21	65
	9	—1	—11	—16	—19	—9	6	21	25	23	25	12	—1	—19	45
[3]	2	10	12	13	8	5	—5	—13	—5	2	3	0	—2	—5	26
	8	9	10	10	9	—2	1	—4	3	0	2	—3	—7	—8	20
	7	12	14	17	15	10	1	—1	—4	—2	—10	—5	—10	11	28
	6	10	12	13	11	4	—2	—7	—3	—1	—3	—5	—9	—10	23
[4]	8	10	14	18	19	13	2	—18	—17	—10	—17	—5	1	4	37
	5	8	12	13	13	8	3	—6	—2	—8	—3	—5	—1	1	21
	0	8	18	21	22	21	6	—6	—16	—13	—8	—8	—11	1	38
	4	9	14	17	18	14	4	—10	—11	—10	—9	—5	—5	2	29
[5]	3	4	7	6	5	1	—6	—13	—10	—4	—4	—5	—3	—1	20
	3	5	7	6	2	—7	12	14	—9	—12	—5	—4	—5	—1	23
	1	3	8	10	7	0	—9	—13	—15	—16	—12	—7	—3	5	26
	2	4	8	8	4	—3	—10	—13	—12	—11	—8	—6	—5	0	21
[6]	8	3	0	2	—5	—7	—8	—8	—6	—7	—6	—5	—3	—3	18
	12	7	2	—6	—13	—16	—16	—10	—10	—8	—7	—8	—8	—7	29
	7	4	0	—6	—6	—3	—3	—3	—3	—5	—8	5	—11	—13	26
	9	2	0	—4	—8	—9	—9	—7	—6	—6	—7	—8	—8	—7	19
[7]	—2	0	1	1	2	2	2	2	2	2	2	0	0	0	5
	—10	—6	—1	3	4	4	4	5	5	5	5	3	3	1	16
	—14	—9	—3	2	4	7	7	6	6	6	5	4	2	1	23
	—9	—4	1	2	3	4	4	5	5	5	4	3	1	1	15
[8]	2	2	1	1	1	1	1	1	1	—1	—1	—2	—2	—2	4
	—2	1	2	2	3	2	4	3	3	2	2	2	2	2	14
	—4	1	4	5	5	3	4	4	4	4	3	3	2	3	18
	—1	1	2	2	2	3	3	2	3	2	2	1	1	0	11
[9]	1	2	3	2	2	2	2	2	1	1	1	0	—1	—2	5
	—6	—2	1	1	2	2	3	4	4	3	3	2	2	2	14
	—7	—2	0	2	3	3	3	4	4	4	4	4	3	3	14
	—4	—1	1	2	2	2	3	3	2	3	3	2	1	1	11
[10]	—1	0	0	0	0	0	0	0	0	—1	—1	0	0	—1	6
	2	2	2	2	2	3	4	3	3	3	3	2	2	2	14
	6	4	4	4	4	4	4	4	5	4	4	5	5	4	20
	3	2	2	2	2	2	2	2	2	2	2	2	3	2	12
[11]	2	2	3	3	3	5	5	5	5	4	4	5	5	1	23
	3	4	4	4	4	6	5	5	6	6	8	6	0	—7	26
	2	3	3	3	4	4	3	3	4	4	5	5	2	—2	21
[12]	1	3	3	1	0	0	0	0	1	0	1	1	0	0	6
	—4	—1	1	1	1	0	3	4	4	5	4	5	3	3	16
	—6	—4	—2	—1	1	1	2	3	5	5	5	4	5	4	19
	—4	—1	1	0	1	0	1	2	3	3	3	3	3	2	13
[13]	4	2	1	0	0	0	1	0	0	0	0	0	0	0	8
	1	2	1	1	1	2	3	3	3	3	3	3	4	3	16
	—1	2	3	2	1	3	3	4	4	5	5	4	4	5	23
	1	2	1	1	1	1	3	2	3	2	2	2	2	2	13

TABLE [illegible]

SOLAR-DAILY GEOMAGNETIC VARIATIONS OF TOTAL INTENSITY F FOR QUIET DAYS (IN GAMMAS) YEAR OF HIGH MAGNETIC ACTIVITY

Observatory and observation year	World time	1	2	3	4	5	6	7	8	9	10
Bukhta Tikhaya 1947 [1]	Winter	10	9	3	−1	2	0	3	2	1	−2
	Equinox	19	18	13	12	−2	−4	−7	−1	−15	−10
	Summer	49	41	34	18	4	19	40	38	13	5
	Year	26	23	17	10	−1	5	12	14	0	−2
Matochkin Shar 1938 [2]	Winter	0	−3	−9	−8	−7	−8	−4	−4	−1	5
	Equinox	−4	4	3	−2	−1	−4	−6	−5	−5	−1
	Summer	9	9	−5	−6	−11	−12	−16	−22	−9	−2
	Year	1	3	−4	−5	−7	−8	−9	−7	−5	0
Tiksi, 1947 [3]	Winter	−7	0	7	14	14	15	12	12	11	12
	Equinox	−10	2	13	23	28	27	22	17	13	10
	Summer	−16	15	23	28	22	18	21	18	13	6
	Year	−9	3	13	20	20	19	27	15	11	9
Uelen, 1938 [4]	Winter	−4	−2	0	1	2	6	7	9	13	13
	Equinox	−1	−1	−1	2	4	6	6	6	7	[illegible]
	Summer	−6	−4	0	3	7	11	11	7	6	[illegible]
	Year	−4	−3	0	2	4	7	8	8	9	9
Leningrad 1927 [sic] [5]	Winter	0	−1	1	1	2	1	−2	−4	−6	−8
	Equinox	3	3	4	5	5	4	−1	−8	−14	−17
	Summer	3	6	5	4	1	−2	−6	−11	−16	−17
	Year	2	3	3	3	2	1	−3	−8	−12	−14
Sverdlovsk, 1948 [6]	Winter	0	1	1	2	2	−1	−4	−5	−5	−5
	Equinox	1	4	5	7	4	−2	−9	−15	−17	−12
	Summer	6	7	6	2	−4	−9	−16	−20	−19	−14
	Year	2	4	3	3	0	−4	−9	−13	−14	−11
Kazan', 1946 [7]	Winter	−1	0	0	1	1	1	−2	−6	−7	−7
	Equinox	1	2	4	6	4	2	−5	−13	−17	−17
	Summer	5	7	7	4	0	−4	−12	−18	−21	−19
	Year	2	4	4	3	2	−1	−6	−12	−15	−14
Irkutsk, 1948 [8]	Winter	1	2	−2	−5	−6	−5	−4	−2	2	2
	Equinox	5	1	−6	−12	−17	−17	−12	−5	1	4
	Summer	−1	−7	−15	−20	−22	−20	−15	−7	1	8
	Year	2	−2	−8	−12	−15	−14	−10	−5	1	4
Tbilisi, 1948 [9]	Winter	−2	−1	0	0	2	2	0	−4	−8	−7
	Equinox	2	2	3	5	6	1	−8	−14	−16	−12
	Summer	4	7	11	10	3	−4	−14	−17	−16	−14
	Year	1	3	4	5	4	0	−7	−12	−13	−11
Tashkent, 1948 [10]	Winter	1	2	3	5	4	−1	−7	−9	−6	−4
	Equinox	4	6	8	5	−3	−10	−14	−14	−11	−6
	Summer	12	15	9	1	−9	−17	−20	−20	−15	−8
	Year	6	8	7	3	−3	−9	−14	−14	−11	−6

	11	12	13	14	15	16	17	18	19	20	21	22	23		Amplitude
[1]	−7	−18	−18	−17	−16	−10	−4	3	9	17	12	7	14	11	35
	−9	−18	−27	−26	−26	−23	−6	0	20	15	14	17	29	22	56
	−2	−16	−42	−57	−56	−47	−48	−37	−22	−8	−6	6	21	51	107
	−6	−17	−29	−33	−33	−27	−20	−12	3	7	6	10	21	28	61
[2]	6	8	6	3	4	5	4	−1	−4	−6	−8	−2	5	11	20
	−1	6	11	15	10	6	2	6	−12	−4	−4	−1	−2	−4	27
	3	10	12	15	15	13	4	−1	−6	−15	−17	−8	3	9	37
	3	0	10	11	10	8	4	−2	−7	−5	−10	−4	2	5	21
[3]	16	19	16	13	5	−5	−17	−26	−22	−23	−22	−18	−14	−12	45
	5	9	7	7	1	−3	−12	−16	−24	−30	−31	−26	−22	−10	59
	4	4	6	−1	4	−3	−9	−15	−24	−32	−32	−29	−26	−16	60
	8	10	9	11	4	−3	−12	−21	−23	−24	−26	−21	−18	−10	53
[4]	8	5	−2	−6	−4	−3	−2	−4	−4	−4	−4	−7	−7	−7	20
	9	7	0	−4	−4	−4	−5	−2	−2	−4	−5	−5	−7	−6	16
	8	5	4	3	2	3	2	1	−2	−6	−9	−14	−15	−14	26
	9	5	1	−2	−3	−1	−2	−1	−3	−6	−5	−9	−10	−10	19
[5]	−5	0	3	3	3	2	3	4	3	2	1	−1	0	1	12
	14	−9	−1	4	6	4	6	5	5	5	4	2	0	2	23
	−14	−8	−1	4	6	7	8	9	8	6	5	4	1	1	26
	−11	−6	0	3	5	4	6	6	5	4	3	2	0	1	20
[6]	−2	1	2	2	2	3	3	3	3	2	1	0	0	0	8
	−6	−1	4	4	4	4	4	5	4	4	3	3	2	2	24
	−9	1	6	8	8	7	5	6	6	5	5	5	5	5	28
	−6	0	4	5	4	5	4	5	4	4	3	3	3	3	19
[7]	−5	−2	1	2	2	2	3	3	4	2	2	1	0	−1	11
	−12	−5	1	4	4	4	5	5	5	5	4	4	3	3	23
	−13	−4	3	7	8	7	6	7	7	5	2	5	4	3	29
	10	−3	1	4	5	4	5	5	5	3	4	2	2	2	20
[8]	1	1	2	2	2	3	2	2	2	2	1	1	2	2	9
	4	2	3.	4	4	5	4	4	4	2	2	3	4	5	22
	11	10	8	6	6	6	7	5	7	7	7	9	9	6	33
	5	4	4	4	4	4	5	4	4	3	3	4	5	5	20
[9]	−4	−3	−2	0	2	3	3	4	4	3	3	3	2	2	12
	−8	−3	0	0	0	1	3	4	5	6	6	6	5	5	22
	−9	−6	−1	2	4	3	2	5	6	6	6	6	6	6	28
	−7	−4	−2	1	1	2	3	4	6	6	5	5	5	5	19
[10]	−3	−2	−1	0	0	1	2	2	3	3	2	2	2	2	14
	0	1	1	0	0	2	3	4	4	4	4	4	4	5	22
	2	4	6	4	2	2	3	4	4	5	4	4	6	7	35
	−2	1	2	1	0	2	3	3	4	4	4	4	4	4	22

[illegible]

[illegible]

[illegible]

[illegible]	[illegible]										
[illegible]	Winter	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	−5[illegible]	−9[illegible]	[illegible]	[illegible]
	Equinox	[illegible]	9	8[illegible]	[illegible]	[illegible]	[illegible]	−4	−6	−13	[illegible]
	Summer	[illegible]	11	10[illegible]	8[illegible]	[illegible]	4[illegible]	−14	−4	[illegible]	[illegible]
	Year	[illegible]	8	7[illegible]	[illegible]	2[illegible]	[illegible]	−3	[illegible]	[illegible]	[illegible]
[illegible]	Winter	[illegible]	−2[illegible]	−4[illegible]	−4	−3[illegible]	−3[illegible]	−4[illegible]	[illegible]	−7	−8
	Equinox	[illegible]	[illegible]	[illegible]	[illegible]	−3[illegible]	−4[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Summer	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	−8	[illegible]	−15
	Year	[illegible]	[illegible]	[illegible]	−2	−2[illegible]	[illegible]	[illegible]	[illegible]	−10	[illegible]
[illegible]	Winter	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	−3[illegible]	−6
	Equinox	4[illegible]	2[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	−1[illegible]	[illegible]	[illegible]
	Summer	[illegible]	[illegible]	[illegible]	1[illegible]	2[illegible]	2[illegible]	2[illegible]	[illegible]	[illegible]	[illegible]
	Year	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Winter	6[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1[illegible]	3[illegible]	2[illegible]	2[illegible]	[illegible]
	Equinox	8	9[illegible]	[illegible]	1[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Summer	[illegible]	5[illegible]	3[illegible]	2[illegible]	[illegible]	1[illegible]	3[illegible]	4	4[illegible]	[illegible]
	Year	7[illegible]	6[illegible]	2[illegible]	1[illegible]	[illegible]	[illegible]	2[illegible]	2[illegible]	2[illegible]	[illegible]
[illegible]	Winter	−1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	20	[illegible]	1[illegible]	[illegible]
	Equinox	−1[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	−14	−3[illegible]	−5[illegible]
	Summer	[illegible]	[illegible]	[illegible]	2[illegible]	3	2[illegible]	[illegible]	24	[illegible]	[illegible]
	Year	−1[illegible]	[illegible]	[illegible]	1[illegible]	2[illegible]	20	2[illegible]	1[illegible]	[illegible]	−2
[illegible]	Winter	3[illegible]	4[illegible]	5[illegible]	6[illegible]	6[illegible]	7[illegible]	8[illegible]	6[illegible]	6[illegible]	4[illegible]
	Equinox	4[illegible]	5	5[illegible]	6[illegible]	6[illegible]	7[illegible]	70	5[illegible]	3[illegible]	1[illegible]
	Summer	1[illegible]	3[illegible]	4[illegible]	6[illegible]	[illegible]	8[illegible]	8[illegible]	6[illegible]	5[illegible]	[illegible]
	Year	[illegible]	4[illegible]	[illegible]	6[illegible]	[illegible]	7[illegible]	7[illegible]	6[illegible]	5[illegible]	[illegible]
[illegible]	Winter	−17	−14	−16	[illegible]	−4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Equinox	−2[illegible]	−24	−20	−1[illegible]	−10	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Summer	−2[illegible]	−19	−20	−1[illegible]	−14	−1[illegible]	−1[illegible]	−14	−1[illegible]	[illegible]
	Year	−20	−19	−17	−12	−9	[illegible]	[illegible]	−6	[illegible]	[illegible]
[illegible]	Winter	[illegible]	10	−7	−4	−3	[illegible]	−3	−3	−2	[illegible]
	Equinox	−20	−20	−10	−12	−10	−6	−10	−9	−4	[illegible]
	Summer	−9	−9	[illegible]	−12	−15	−19	−21	−20	−15	[illegible]
	Year	[illegible]	−8	[illegible]	−9	−9	−10	−11	−11	[illegible]	1
[illegible] (9)	Winter	+1	−10	−7	−5	−3	−3	−4	−5	−4	−2
	Equinox	−19	−19	−17	−13	−9	−9	−11	−12	−10	−4
	Summer	−9	−8	−8	10	−13	−16	−19	−21	−19	−13
	Year	13	12	−11	9	−8	−9	−11	−13	−11	−6
[illegible] (10)	Winter	0	1	0	−2	−2	−1	1	2	3	3
	Equinox	−4	7	12	−15	−16	−13	−8	0	8	13
	Summer	−6	13	−19	−23	−23	−19	−13	−5	4	11
	Year	−3	−6	−10	−13	−14	−11	−7	1	5	9
[illegible] (11)	Winter	3	3	4	5	6	6	4	0	−3	−4
	Equinox	8	8	7	7	6	0	−9	−14	−16	−16
	Summer	10	12	13	10	3	−6	−15	−19	−19	−18
	Year	7	8	8	7	5	0	−7	−11	−13	−13
[illegible] (12)	Winter	4	5	6	8	7	2	−1	−2	−1	−1
	Equinox	7	7	7	4	−4	−10	−15	−14	−10	−7
	Summer	13	13	7	−1	−11	−18	−21	−19	−14	−10
	Year	8	8	7	4	−5	−9	−12	−12	−8	−6

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11 12 13 14 15 16 17 18 19 20 21 22 23

[1]	-137	-124	-92	-60	-28	11	52	75	106	101	77	75	81	69	243
	-167	-161	-137	-97	-58	-9	41	64	79	89	110	115	115	110	282
	-191	-181	-157	-129	-97	-65	-13	27	44	70	90	111	119	119	310
	-165	-155	-129	-95	-61	-22	27	55	76	87	92	100	106	99	271
[2]	-102	-92	-73	-39	-30	7	86	124	137	126	99	75	61	7	239
	-150	-126	-126	-85	-19	56	78	121	165	156	112	105	44	25	315
	-165	-152	-125	-81	-25	-27	57	101	118	141	138	118	93	56	307
	-139	-123	-103	-68	-25	12	74	115	140	141	116	99	66	29	280
[3]	-24	-43	-77	-119	-114	-93	-47	14	74	98	112	97	61	11	231
	-91	-112	-138	-139	-128	-100	-13	58	102	136	138	132	103	44	277
	-60	-94	-118	-108	-93	-72	-38	11	48	100	100	92	66	33	218
	-58	-83	-111	-122	-112	-88	-33	28	75	111	112	107	77	54	234
[4]	3	-11	-62	-114	-148	-144	-108	-76	-6	63	94	91	93	70	242
	33	-58	-80	-113	-139	-136	-94	-38	3	50	103	114	110	84	253
	5	-61	-98	-108	-115	-103	-115	-53	-18	30	57	82	88	72	203
	8	-43	-80	-112	-134	-128	-106	-55	-7	48	85	96	97	76	231
[5]	-17	-3	-30	-2	4	22	46	18	-2	-6	-30	-32	-34	-22	79
	-65	-49	-27	5	19	56	52	78	45	8	20	-28	-19	-16	143
	6	5	-3	-4	14	4	6	9	-21	-24	-40	-48	-35	-13	80
	-20	-16	-20	0	12	27	34	32	4	-7	-17	-36	-30	17	70
[6]	13	-45	-66	-90	-90	-90	-83	-90	-76	-41	-17	2	16	32	175
	-28	-44	-54	-54	-62	-67	-71	-66	-61	-45	-22	-5	15	34	144
	-8	25	-40	-45	-58	-60	-78	-78	-58	-44	-35	-23	-6	13	160
	-8	-23	-53	-63	-70	70	-77	-78	-65	-43	-24	-9	8	26	157
[7]	2	6	12	16	19	19	20	16	9	3	-6	-14	-17	-17	37
	3	15	25	35	38	38	36	22	9	-4	-17	-24	-25	-26	64
	-4	6	18	27	34	37	32	24	15	4	-6	-14	-18	-21	59
	0	9	18	26	30	31	29	-21	11	1	10	-17	-20	-21	52
[8]	6	10	13	17	19	18	13	6	-1	-5	-10	-14	-15	-14	34
	19	33	35	40	37	29	19	7	6	-14	-19	-24	-25	-24	65
	7	18	28	33	30	25	18	11	6	0	-6	-10	-11	-12	54
	11	20	24	30	29	24	17	8	0	-6	12	-16	-17	-17	47
[9]	2	6	10	13	17	17	15	9	3	-2	-6	-11	-13	-12	30
	8	21	28	36	36	33	23	13	4	-6	-12	-18	-20	-21	57
	-2	9	21	30	32	28	21	14	9	4	-2	-7	-9	-11	53
	3	12	20	26	28	26	20	19	5	-1	-7	-12	-14	-13	42
[10]	4	5	7	7	5	3	0	-2	-3	-5	-6	-6	-5	-4	13
	18	19	18	16	11	7	4	0	-3	-7	-7	-9	-7	-6	35
	18	19	16	14	12	10	8	7	4	2	0	0	-1	-4	12
	13	14	14	12	9	7	4	2	-1	-3	4	-5	-4	5	28
[11]	-4	-4	-4	-5	-5	-4	-3	0	0	1	2	3	2	0	11
	13	9	-5	-3	-1	1	4	5	6	7	8	6	6	6	24
	14	-10	-7	-3	1	2	4	7	9	9	9	8	8	6	32
	10	-8	-5	-4	-2	0	2	4	5	6	6	6	1	4	21
[12]	-3	4	-5	-6	-4	-3	-2	0	0	0	1	1	-1	-1	14
	-5	-3	-2	0	1	4	5	6	6	5	6	4	3	4	22
	-6	-2	1	3	2	4	6	6	8	8	8	7	7	7	31
	-5	-3	-2	-1	0	2	3	4	5	4	5	4	3	3	20

TABLE 36

SOLAR-DAILY GEOMAGNETIC VARIATIONS OF TOTAL INTENSITY (F) FOR DISTURBED DAYS (IN GAMMAS) YEAR OF LOW MAGNETIC ACTIVITY

Observatory and observation year	World time	1	2	3	4	5	6	7	8	9	10
Bukhta Tikhaya 1944 [1]	Winter	72	52	40	11	−8	−9	−50	−100	−123	−142
	Equinox	86	80	77	34	23	−1	46	−109	−130	−149
	Summer	86	91	71	62	46	29	2	−23	−66	−112
	Year	82	74	82	35	21	−1	−31	−78	−106	−134
Mys Chelyuskin, 1944 [2]	Winter	−26	−53	−51	−37	−37	−34	−38	−56	−78	−98
	Equinox	20	1	−9	−34	−35	−23	−48	−71	−93	−83
	Summer	50	−12	−1	−1	1	−6	−22	−58	−94	−123
	Year	17	−23	−21	−25	−24	−22	−39	−61	−89	−102
Dikson, 1944 [3]	Winter	−2	−18	−10	−6	3	10	9	18	9	−4
	Equinox	22	−3	−17	−19	−5	2	12	8	−4	−23
	Summer	7	3	9	16	4	7	13	20	21	8
	Year	7	−6	−6	−3	0	6	11	14	8	−6
Matochkin Shar 1944 [4]	Winter	52	33	13	1	12	24	39	45	47	38
	Equinox	87	45	6	−21	−10	−16	8	28	17	10
	Summer	25	19	9	9	−13	−1	3	19	26	35
	Year	55	33	9	−4	−4	2	16	31	30	22
Tiksi, 1944 [5]	Winter	−5	10	16	20	31	28	23	31	27	13
	Equinox	−1	9	19	38	30	28	29	22	26	23
	Summer	−1	3	7	11	13	17	17	33	32	30
	Year	−4	5	13	23	24	23	23	28	28	23
Uelen, 1943 [6]	Winter	56	64	72	83	90	99	100	95	65	32
	Equinox	42	55	72	92	119	103	115	90	42	−9
	Summer	38	55	86	97	92	100	105	89	81	21
	Year	44	60	77	91	100	102	107	92	63	15
Leningrad 1933 [7]	Winter	−16	−14	−12	−10	−8	−4	−3	−2	−1	1
	Equinox	−21	−19	−13	−13	−9	−8	−4	−3	−5	−2
	Summer	−16	−13	−13	−17	−16	−14	−14	−17	−11	−15
	Year	−18	−16	−13	−14	−11	−8	−7	−8	−6	−6
Sverdlovsk, 1944 [8]	Winter	−7	−5	−4	−2	−2	−2	−2	−2	1	1
	Equinox	−12	−11	−8	−6	−5	−5	−10	−10	−7	2
	Summer	0	0	−2	−5	−8	−12	−14	−15	−11	−7
	Year	−6	−6	−4	−4	−5	−7	−9	−9	−6	0
Kazan', 1944 [9]	Winter	−8	−7	−6	−4	−2	−4	−3	−3	−3	−1
	Equinox	−10	−10	−7	−5	−2	−3	−6	−10	−10	−5
	Summer	0	−1	−1	−4	−5	−6	−12	−13	−13	−11
	Year	−7	−6	−5	−4	−3	5	−7	−9	−8	−6
Irkutsk, 1944 [10]	Winter	2	2	1	2	1	2	2	3	2	2
	Equinox	−2	−4	−10	−12	−11	−8	−8	−3	1	7
	Summer	−2	−8	−13	−16	−15	−12	−8	−4	1	6
	Year	−1	−2	−6	−8	−7	−6	−3	−2	1	5
Vladivostok, 1944 [11]	Winter										
	Equinox	−7	−13	−13	−9	−5	−1	−2	−1	−4	1
	Summer	−13	−17	−15	−11	−8	−3	−1	1	1	0
	Year	−7	−11	−12	−9	−5	−2	−1	−1	−1	0
Tbilisi, 1944 [12]	Winter	3	5	5	6	8	6	2	0	−3	−3
	Equinox	−1	2	1	3	3	2	−8	−11	−10	−8
	Summer	8	8	11	11	5	0	−12	−16	−16	−15
	Year	4	6	6	7	5	2	−7	−10	−10	−9
Tashkent, 1944 [13]	Winter	3	5	6	6	5	2	0	2	2	1
	Equinox	4	5	5	4	−3	−7	−10	−13	−11	−7
	Summer	9	9	7	0	−8	−16	−18	−15	−11	−7
	Year	6	6	5	3	−2	−7	−10	−8	−7	−4

	11	12	13	14	15	16	17	18	19	20	21	22	23	Amplitude
[1]	-142	-126	-99	-47	-12	29	95	91	97	94	76	84	59	75	239
	-152	-145	-112	-77	-75	11	31	79	117	127	104	75	71	85	279
	-129	-141	-132	-113	-82	-46	17	44	42	53	65	77	77	86	232
	-142	-138	-115	-78	-56	-2	48	71	86	92	82	79	70	82	234
[2]	109	-99	-51	-11	-17	21	111	176	106	116	100	92	60	-21	225
	-115	-113	-146	-80	-33	68	61	119	136	154	127	75	94	21	300
	-129	-116	-105	-71	-16	12	71	78	96	97	111	103	82	48	240
	118	-111	-100	-55	0	33	82	124	114	123	117	91	79	17	242
[3]	-24	-33	-103	-142	-145	-78	-27	38	76	117	135	110	71	-2	280
	-49	-74	-88	-95	-100	-101	-23	59	96	103	97	98	81	24	204
	1	-30	-44	-56	-60	-51	-38	-4	18	129	44	44	31	7	189
	-24	-46	-78	-98	-101	-76	-28	29	64	84	92	84	61	11	193
[4]	26	13	-61	-140	-134	-125	-116	-119	-10	67	81	57	54	54	221
	-11	-36	-42	-72	-86	-147	-95	-71	-4	39	97	113	114	88	261
	26	-1	-13	4	-28	-67	-92	-59	-25	6	12	55	61	25	153
	15	-7	-40	-81	-93	-110	-100	-82	-13	30	60	88	66	55	198
[5]	-1	0	-28	-20	2	4	51	19	-55	-23	-42	-44	-36	-14	106
	-5	-27	-1	12	-3	41	1	8	-25	-62	-74	-51	-30	-6	115
	37	13	24	3	15	-9	1	-20	-46	-63	-49	-45	-20	-2	100
	11	-4	0	1	4	13	15	5	-40	-50	-56	-45	-27	-5	84
[6]	28	-109	-100	-127	-135	-107	-82	-88	-55	-29	-5	18	29	55	235
	-75	-103	-87	-97	-78	-131	-44	-54	-40	-25	-22	9	29	41	250
	-52	-91	-56	-72	-110	-121	-124	-67	-52	-36	-25	0	18	36	229
	-56	-103	-81	-100	-107	-121	-98	-70	-48	-30	-17	9	28	44	228
[7]	4	5	10	15	23	31	29	22	14	-2	-11	-21	-26	-23	57
	0	6	16	26	30	33	32	24	14	0	-12	-18	-26	-30	63
	11	0	9	18	38	51	44	29	18	2	-10	-15	-18	-20	71
	-2	4	13	22	31	39	34	25	16	0	-11	-18	-23	-25	64
[8]	5	6	9	14	18	20	5	-1	-5	-7	-9	-13	-13	-12	33
	12	17	16	14	12	11	9	6	3	-3	-5	-6	-8	-10	29
	1	9	14	14	14	11	9	6	4	4	1	-2	-4	-4	29
	6	11	13	14	14	14	8	5	1	-2	-4	-7	-8	-9	23
[9]	1	4	6	10	13	21	12	7	1	-2	-8	-10	-11	-10	32
	2	9	13	13	11	13	10	9	6	3	-1	-1	-4	-7	23
	-5	2	7	11	13	12	10	8	6	6	4	-1	-1	-3	26
	0	5	8	12	14	16	10	8	4	2	-2	-4	-5	-7	25
[10]	3	4	5	4	2	2	-4	-5	-6	-6	-6	-4	-3	-1	11
	12	10	8	8	6	5	4	3	1	-2	-2	-2	-2	-2	24
	9	9	8	8	10	7	5	4	4	4	4	3	2	-1	26
	7	7	8	7	5	4	1	0	-1	-1	-2	-2	-1	-2	16
[11]	0	2	5	5	6	7	6	6	6	5	5	5	3	-4	20
	2	4	5	7	10	9	9	9	7	8	8	6	-1	-9	27
	1	2	4	5	7	6	6	6	5	5	5	4	2	-4	19
[12]	-4	-3	-6	-7	-10	-7	-5	-1	-1	2	4	4	2	1	18
	5	-1	1	-1	0	1	5	3	4	4	4	4	4	4	16
	-9	-7	-7	-5	0	0	2	4	5	7	8	8	8	5	27
	-6	-4	-4	-4	-2	-1	1	3	3	4	6	5	4	4	17

[13]	0	-2	-6	-7	-7	-3	-1	0	-4	-1	0	0	1	2	13
	-5	-4	-2	0	0	3	2	6	7	6	5	5	4	4	20
	-3	-2	-2	0	3	4	4	6	6	7	8	6	6	5	27
	2	-3	-3	-3	-2	2	2	4	3	4	3	4	3	3	16

TABLE 37

SOLAR-DAILY GEOMAGNETIC VARIATIONS OF TOTAL INTENSITY (F) FOR DISTURBED DAYS (IN GAMMAS) YEAR OF HIGH MAGNETIC ACTIVITY

Observatory and observation year	World time	1	2	3	4	5	6	7	8	9	10
Bukhta Tikhaya 1938 [1]	Winter	66	43	48	51	43	−27	−58	−98	−119	−126
	Equinox	135	85	32	12	21	−15	−48	−83	−126	−132
	Summer	148	113	115	125	102	24	−20	−31	−73	−196
	Year	117	81	65	63	54	−9	−41	−70	−106	−151
Matochkin Shar, 1938 [2]	Winter	91	60	40	24	23	24	30	19	22	5
	Equinox	100	147	82	54	33	34	17	25	−12	−32
	Summer	118	101	32	18	3	27	54	59	68	50
	Year	104	103	51	32	19	28	34	35	23	8
Tiksi, 1947 [3]	Winter	−44	−18	−10	0	13	11	14	6	8	[illegible]
	Equinox	−23	4	3	0	13	16	15	−30	−102	−161
	Summer	−10	−12	20	30	64	46	59	27	−39	−39
	Year	−25	0	4	10	30	25	29	1	−45	−71
Uelen, 1938 [4]	Winter	22	28	37	46	50	70	76	86	66	50
	Equinox	27	42	50	56	61	52	44	25	−1	0
	Summer	4	11	24	48	66	83	63	37	44	16
	Year	18	29	40	52	61	70	64	55	37	23
Leningrad, 1927 [sic] [5]	Winter	−11	−7	−3	−2	−1	−1	−2	−2	−3	[illegible]
	Equinox	−26	−31	−26	−22	−18	−22	−18	−19	−20	−14
	Summer	−18	−23	−42	−17	−10	−14	−17	−18	−13	[illegible]
	Year	−19	−20	−24	−14	−10	−13	−12	−13	−12	−8
Sverdlovsk, 1948 [6]	Winter	−9	−6	−4	−2	−2	−3	−5	−6	−6	[illegible]
	Equinox	−24	−20	−13	−10	−11	−12	−13	−14	−9	[illegible]
	Summer	−10	−11	−13	−12	−15	−19	−23	−24	−18	[illegible]
	Year	−14	−12	−10	−8	−9	−11	−14	−15	−11	−2
Kazan', 1948 [7]	Winter	−10	−7	−5	−3	−1	−2	−4	−6	−5	−6
	Equinox	−20	−20	−13	−10	−10	−10	−13	−15	−13	−8
	Summer	−8	−7	−9	−9	−12	−16	−21	−24	−23	−15
	Year	−13	−11	−9	−8	−8	−10	−12	−15	−14	−10
Irkutsk, 1948 [8]	Winter	1	2	0	−2	−3	−2	0	0	1	3
	Equinox	−5	−7	−10	−16	−19	−20	−12	−5	3	8
	Summer	−10	−17	−22	−26	−29	−25	−20	−10	3	14
	Year	−5	−7	−11	−14	−17	−16	−11	−5	3	9
Tbilisi, 1948 [9]	Winter	5	6	6	8	10	12	9	2	−2	−4
	Equinox	9	8	7	9	5	−2	8	−13	−16	−18
	Summer	9	12	14	12	4	−5	−21	−26	−26	[illegible]
	Year	8	8	9	10	6	1	−7	−13	−14	[illegible]
Tashkent, 1948 [10]	Winter	6	8	8	12	10	6	1	−2	−1	−3
	Equinox	8	10	8	7	−6	−16	−21	−17	−14	−11
	Summer	16	17	13	5	−8	−18	−29	−31	−25	−18
	Year	11	12	11	8	−2	−10	−16	−17	−14	−11

	11	12	13	14	15	16	17	18	19	20	21	22	23		Amplitude
[1]	-118	-124	-118	-85	-16	35	40	76	102	80	51	83	96	72	228
	-143	-132	-122	-69	-42	-17	4	39	39	78	107	130	122	134	278
	-196	-179	-146	-133	-125	-92	-12	18	32	53	97	107	114	143	344
	-152	-145	-128	-96	-63	-25	10	43	57	70	84	101	113	117	269
[2]	-1	-34	-104	-155	-234	-204	-116	-82	-33	104	132	139	141	93	375
	-55	-111	-135	-188	-173	-146	-98	-40	8	51	95	117	125	101	335
	-47	-113	-125	-130	-145	-121	-144	-70	-36	29	69	72	114	118	263
	-34	-85	-121	-157	-184	-157	-120	-64	-3	56	93	109	126	103	310
[3]	-19	-24	-50	-8	-10	63	85	54	17	-8	-9	9	-12	-46	135
	-147	-123	-45	-35	29	81	82	138	114	50	103	27	8	-21	299
	-28	-23	-28	13	16	18	9	19	8	-18	-48	-54	-39	-7	118
	-65	-57	-42	-11	11	55	56	70	47	8	15	-5	-14	-25	141
[4]	13	-47	-75	-44	-21	-44	-58	-84	-117	-67	-32	2	13	20	203
	-13	-25	-60	-26	-13	-19	-51	-66	-53	-63	-50	-11	10	24	127
	-3	-24	-28	-10	-29	-36	-61	-49	-42	-40	-33	-20	-15	4	144
	-1	-32	-37	-27	-22	-35	-57	-68	-72	-56	-40	-16	0	13	142
[5]	-1	5	10	16	16	18	19	13	3	-9	-17	-12	-15	-10	36
	2	33	48	68	62	58	42	19	-10	-20	-26	-36	-28	-36	104
	-1	9	29	37	44	42	32	22	13	8	-6	-14	-19	-16	86
	0	15	29	41	41	40	31	18	2	-7	-16	-21	-21	-20	65
[6]	3	6	11	14	18	19	14	8	2	-3	-8	-14	-13	-10	33
	10	25	29	31	25	23	17	9	2	-4	-8	-11	-8	-9	55
	7	21	30	31	29	25	19	12	7	1	-4	-12	-9	-12	55
	7	18	24	26	24	22	17	11	4	[illegible]	-6	-12	-10	-10	41
[7]	-2	3	10	12	15	18	16	10	6	1	-4	-11	-12	-10	30
	2	15	21	31	25	24	18	13	6	1	-2	-7	-5	-7	51
	-4	7	19	28	30	28	23	16	10	7	-1	-8	-6	-10	54
	-2	9	16	24	23	23	18	13	8	3	-2	-9	-8	-8	39
[8]	2	4	7	8	5	2	0	-3	-5	-4	-3	-5	-4	-3	13
	12	12	14	13	10	9	7	6	0	-1	-2	-3	0	0	34
	24	25	20	16	14	12	10	9	5	4	2	3	-1	-3	54
	12	14	13	12	9	8	5	4	0	0	-1	-1	-2	-2	31
[9]	-3	-5	-5	-6	-8	-9	-7	-5	-5	-3	2	2	-1	-2	21
	-14	-12	-6	-2	-1	0	2	7	8	8	10	7	7	8	28
	17	-12	-7	-1	3	3	6	10	11	13	13	9	10	8	40
	-11	-11	-6	-2	-2	-2	0	4	4	6	8	6	6	5	25
[10]	-3	-5	-6	-5	-7	-7	-5	-4	-4	-3	4	2	0	-1	19
	-10	-10	-6	0	0	3	5	10	9	9	12	7	7	8	33
	-10	-4	3	5	4	5	10	11	7	12	10	9	8	9	48
	-7	-6	-3	0	-2	0	3	6	3	6	8	7	5	5	29

POOR ORIGINAL

TABLE 38

DISTURBED DAILY GEOMAGNETIC VARIATIONS OF DECLINATION D (IN MINUTES)

Observatory and observation year	World time	1	2	3	4	5	6	7	8	9	10
Bukhta Tikhaya 1937 [1]	Winter	−0.3	14.6	19.3	18.8	26.7	37.7	19.8	28.5	12.3	14.5
	Equinox	−0.6	8.9	18.4	18.2	37.0	26.1	36.5	37.5	54.8	34.8
	Summer	−4.1	−5.0	0.9	2.2	7.7	14.4	30.4	32.0	34.1	44.9
	Year	−1.6	5.5	12.9	13.1	18.7	26.0	28.9	33.4	33.6	31.4
Dikson, 1937 [2]	Winter	27.1	42.6	45.9	41.9	20.3	19.5	13.5	5.6	−7.9	−12.3
	Equinox	16.3	36.6	42.0	62.3	50.1	49.6	29.8	10.7	13.0	1.4
	Summer	11.7	40.8	34.9	54.2	53.4	52.0	35.7	35.0	34.8	22.0
	Year	18.3	39.9	40.8	52.8	41.1	40.5	26.4	17.3	13.4	2.9
Matochkin Shar 1937 [3]	Winter	16.9	27.4	18.8	18.8	11.2	4.2	−1.8	−3.3	−4.5	−8.3
	Equinox	13.3	24.9	10.3	8.8	24.7	19.5	18.7	13.8	6.4	3.0
	Summer	15.8	19.9	26.2	25.9	21.4	12.5	18.4	18.3	15.6	0.7
	Year	19.5	28.9	23.6	14.2	14.4	7.7	7.9	6.2	2.8	−4.1
Tiksi, 1947 [4]	Winter	13.9	10.6	−0.4	−8.4	−8.0	1.8	1.3	−3.7	−4.0	1.9
	Equinox	10.1	5.5	3.3	−7.5	9.1	7.1	−1.6	−3.8	−3.4	−4.8
	Summer	26.2	23.2	18.3	14.5	18.1	13.8	13.3	10.9	11.7	−5.8
	Year	18.8	15.6	10.1	3.1	10.5	12.0	9.2	6.6	7.3	−7.8
Uelen, 1937 [5]	Winter	−4.3	−0.6	1.5	5.5	10.0	8.9	6.5	2.5	1.4	3.5
	Equinox	−1.4	−4.6	−1.1	5.4	7.7	7.0	3.6	2.9	0.7	−3.9
	Summer	−4.4	−3.7	−1.7	−1.0	2.2	5.3	6.9	4.7	3.8	2.6
	Year	−3.3	−3.0	−0.4	3.3	6.8	7.0	5.7	3.4	2.0	−1.7
Srednikan, 1948 [6]	Winter	2.5	3.6	3.3	4.1	5.4	3.1	−3.6	−4.1	−4.7	4.2
	Equinox	3.3	3.1	3.2	1.3	0.4	0.6	−2.3	−2.9	−2.3	−3.8
	Summer	0.8	0.1	0.7	1.7	1.8	0.1	−0.5	−1.2	0.0	−0.9
	Year	2.2	2.2	2.4	2.4	2.5	0.7	2.1	−2.8	−2.3	−2.9
Yakutsk, 1948 [7]	Winter	4.4	4.5	2.4	4.0	3.9	−2.2	−2.5	−3.2	−3.7	−4.4
	Equinox	4.2	4.4	1.6	−0.5	0.9	−2.3	−2.2	−2.3	−4.5	−4.5
	Summer	2.4	0.8	0.3	0.9	−0.5	−2.3	−1.6	−0.8	1.7	−1.2
	Year	3.6	3.3	1.4	1.7	1.4	−2.2	−2.1	−2.1	−3.3	−3.5
Leningrad, 1948 [8]	Winter	5.3	3.7	−2.2	1.2	0.9	−1.6	−1.3	−3.6	−2.9	−2.3
	Equinox	1.3	3.3	3.2	2.1	0.1	−2.0	−4.2	−5.5	−4.9	−3.1
	Summer	1.1	2.6	1.2	0.7	0.4	−1.3	−2.6	−0.5	0.9	0.5
	Year	2.3	3.2	0.8	1.3	−0.2	−1.6	−3.4	−3.2	−2.3	−1.6
Sverdlovsk, 1948 [9]	Winter	2.8	0.9	0.8	0.1	−1.6	−2.3	2.7	−2.6	−3.2	−3.4
	Equinox	1.8	1.4	−0.6	−0.5	−1.5	3.1	−3.8	−4.0	−2.2	−2.3
	Summer	0.3	2.5	1.0	0.5	0.3	−1.2	−1.9	−2.2	−1.9	−0.5
	Year	1.6	1.6	0.4	0.0	−0.9	−2.2	−2.8	−3.0	−2.5	−2.1
Kazan', 1948 [10]	Winter	0.6	1.4	1.0	−0.9	−0.7	−1.8	−2.0	−3.2	−3.0	−2.8
	Equinox	1.4	−0.1	0.1	−1.0	−1.4	−1.8	−2.3	−2.6	−3.0	3.0
	Summer	2.0	0.8	0.7	0.7	−0.9	−1.3	−2.2	−2.0	−0.5	1.1
	Year	1.3	0.7	0.5	−0.3	−0.9	−0.6	−2.2	−2.5	−2.2	1.5
Moscow, 1948 [11]	Winter	2.3	1.9	−0.6	−0.5	−1.6	−2.2	−2.9	−3.2	−2.9	−2.4
	Equinox	0.1	1.2	0.2	−0.3	−1.1	−2.4	−3.5	−4.3	−3.3	−2.1
	Summer	0.5	1.0	1.0	−0.5	−0.7	−1.9	−2.5	−0.7	0.6	0.5
	Year	1.0	1.3	−0.3	−0.4	−1.1	−2.1	−3.1	−2.7	−1.9	−1.3
Irkutsk, 1948 [12]	Winter	2.3	2.6	1.7	−0.7	−0.9	−1.3	−1.5	−2.3	−2.2	−2.0
	Equinox	1.6	0.8	1.0	−0.7	−0.4	−0.1	−0.8	−2.8	−4.0	−4.2
	Summer	0.4	1.0	0.5	0.0	0.9	0.6	−0.1	0.8	−1.9	−1.6
	Year	1.5	1.4	1.0	−0.5	0.2	−0.4	−0.9	−1.9	−2.7	−2.5
Odessa, 1948 [13]	Winter	1.6	1.2	0.0	0.1	−0.6	−1.0	−1.7	−1.7	−2.0	−1.5
	Equinox	0.5	0.6	0.7	0.5	0.1	−0.7	−1.9	−2.8	−2.6	−1.8
	Summer	0.2	0.4	0.6	0.0	−0.3	−1.1	−1.6	−0.4	−0.1	0.0
	Year	0.7	0.8	0.3	0.2	−0.2	−1.0	−1.6	−1.7	−1.4	−1.0
Vladivostok, 1947 [14]	Winter	1.5	1.2	2.0	1.7	1.3	0.5	−0.2	−0.6	−1.0	−2.0
	Equinox	1.5	2.7	2.5	1.9	2.2	0.9	0.1	−1.1	−2.5	−2.8
	Summer	0.3	0.4	0.6	0.7	1.1	1.3	1.1	0.6	−0.5	−0.7
	Year	1.1	1.4	1.7	1.5	1.6	0.8	0.2	−0.5	−1.4	−2.1
Tbilisi, 1948 [15]	Winter	1.1	0.8	0.6	−1.8	−0.4	−0.9	−0.7	−1.5	−1.7	−1.4
	Equinox	0.8	−0.1	0.0	−1.7	−0.6	−0.3	−0.8	−1.1	−1.3	−1.2
	Summer	0.8	0.3	0.3	−0.3	−0.2	−0.7	−1.0	−1.0	−0.1	0.9
	Year	1.0	0.4	0.2	−1.3	−0.4	−0.6	−1.0	−1.2	−1.1	−0.6
Tashkent, 1948 [16]	Winter	1.0	0.7	0.2	0.1	−0.2	−2.1	−0.9	−1.2	−1.1	−1.3
	Equinox	0.5	0.0	0.2	−0.3	0.4	−1.8	−1.1	1.5	−1.3	−1.0
	Summer	0.2	0.2	0.9	0.4	0.2	−0.4	−1.0	1.0	−0.9	−0.6
	Year	0.5	0.3	0.3	0.0	−0.1	−1.5	−1.0	−1.3	1.1	−0.9

	11	12	13	14	15	16	17	18	19	20	21	22	23		Amplitude
[1]	20.3	10.1	15.4	-0.0	18.4	1.1	-23.6	-29.6	-36.3	-52.7	-60.1	-40.3	-28.8	-6.6	97.8
	33.0	18.8	19.8	28.3	18.2	-17.5	-49.3	-56.1	-70.8	-54.3	-49.6	-43.3	-29.8	21.3	125.6
	61.2	59.2	59.5	45.9	-2.0	-16.1	-31.9	-82.2	-65.2	-49.9	-39.2	-30.2	-25.2	-25.5	143.4
	38.3	29.5	31.6	31.5	11.6	-10.9	-34.9	-56.0	-57.8	-52.1	-49.5	-37.7	-27.7	-17.5	96.1
[2]	-12.7	-13.2	-11.2	-15.8	-23.6	-22.3	-21.2	-33.4	-18.3	-24.1	-32.2	3.0	15.1	13.6	79.3
	-2.7	-3.8	-10.1	-27.5	-29.4	-31.4	-30.4	-31.8	-42.2	-41.2	-35.4	-25.8	-6.9	5.5	104.5
	13.2	0.2	-5.4	-6.2	-25.1	-50.0	-52.0	-62.7	-53.1	-46.6	-34.4	-26.7	-19.3	-5.6	116.9
	-0.7	-5.5	-8.9	-16.3	-26.1	-34.7	-34.6	-42.5	-37.9	-37.2	-34.1	-16.5	-3.9	4.5	95.3
[3]	-3.8	-4.3	-11.6	-7.8	-8.9	-13.3	-5.3	-8.8	-5.5	-9.8	-4.0	-10.2	1.7	11.5	40.7
	-0.5	-8.5	-8.7	-7.9	-13.5	-9.8	-9.9	-18.7	-25.3	-24.1	-19.9	-5.8	2.5	6.4	50.2
	3.4	0.4	-9.2	-17.6	-23.8	-29.5	-27.9	-28.4	-21.5	-16.7	-13.7	-7.1	6.5	11.3	55.7
	-2.6	-5.7	-11.2	-10.9	-15.7	-17.4	-13.7	-17.6	-16.0	-14.9	-10.2	-4.8	6.9	13.6	46.5
[4]	-0.6	-4.4	-5.2	-9.5	-13.2	-12.4	-13.9	-18.7	-12.7	-0.2	13.6	22.1	24.4	25.4	44.1
	-5.2	-11.1	-14.4	-18.4	-27.5	-30.9	-34.7	-24.3	4.0	26.4	35.1	31.4	33.1	23.1	69.8
	-1.5	5.0	7.5	7.8	-22.5	-33.1	-33.1	-25.5	-14.5	-0.3	10.0	17.5	23.6	23.7	59.3
	-10.5	-14.9	-16.2	-18.1	-23.6	-27.5	-28.9	-23.9	-8.5	8.4	19.7	24.4	27.8	25.5	55.3
[5]	-5.7	-5.2	-2.8	-2.7	-2.1	-2.6	-1.8	-2.4	-1.1	-1.8	0.6	1.3	0.9	-0.7	15.7
	-1.5	-0.4	1.7	1.7	0.2	0.7	-2.2	-3.3	-3.5	-0.7	1.3	-2.3	-3.8	-3.7	11.6
	0.9	0.5	1.4	2.9	3.4	1.7	0.2	2.1	-2.2	-3.4	-5.5	-4.8	-9.6	-3.9	16.5
	-2.1	-1.6	0.5	0.7	0.3	-0.1	-1.2	-1.3	-2.3	-2.0	-1.2	-2.0	-4.7	-2.8	11.7
[6]	-3.5	-2.8	-1.4	-0.8	-0.7	-0.7	-1.3	-0.9	0.2	2.1	1.2	0.2	1.0	1.9	10.1
	-3.4	-2.5	-2.1	-0.5	-0.2	-0.2	-0.5	-0.4	1.2	0.7	3.8	5.9	3.9	1.8	9.7
	0.2	-1.6	-1.1	-0.9	-0.5	0.0	-0.3	-0.1	-1.2	0.3	0.7	1.4	0.2	-0.6	3.4
	-2.2	-2.8	-2.1	-1.1	-0.8	-0.6	-0.8	-0.2	0.1	1.1	1.9	2.5	1.7	1.0	5.1
[7]	-3.9	-2.1	-1.4	-1.3	-1.0	-1.0	-0.8	-0.6	0.8	0.4	-0.5	2.2	1.3	4.4	8.9
	-5.2	5.0	-2.7	-1.0	-1.3	-1.0	0.5	1.3	0.2	2.7	6.5	4.8	2.0	3.2	11.7
	-2.6	-2.2	-1.5	-1.1	0.1	1.0	0.5	-0.9	1.3	0.6	1.6	2.6	1.4	1.3	5.2
	-3.9	-3.2	-1.9	-1.1	-0.7	0.3	0.0	0.6	0.9	1.2	2.5	3.2	1.6	3.0	7.5
[8]	-1.9	-1.6	-0.7	-0.5	-1.9	-2.5	-4.4	-2.2	-0.2	2.4	3.9	5.4	7.1	5.3	11.5
	-2.9	-2.1	-1.7	-1.8	-1.5	-1.1	-0.2	0.6	1.9	2.1	2.5	4.7	5.4	4.5	10.9
	1.1	-0.1	-0.2	-1.7	-2.3	-3.0	-2.5	-0.8	0.6	0.4	0.4	1.4	1.3	2.9	5.9
	-1.2	-1.3	-0.9	-1.5	-1.9	-2.2	-2.4	-0.9	0.7	1.5	1.3	3.7	4.5	4.2	7.9
[9]	-2.5	-1.6	-1.0	-1.5	-0.5	-0.5	-0.8	-0.9	-0.9	3.1	5.0	4.7	4.4	3.1	8.4
	-2.6	-1.1	-0.9	0.0	0.6	0.7	1.0	1.3	1.9	2.1	2.4	2.1	2.1	2.6	6.6
	1.5	1.4	0.4	-0.3	-1.0	-2.4	-1.0	-0.6	0.1	1.1	2.1	0.8	0.7	0.3	4.9
	-1.2	-0.5	-0.3	-0.5	-0.3	-0.8	-0.1	0.0	0.8	2.2	3.2	2.5	2.4	2.0	6.2
[10]	-1.9	-1.2	-1.3	-0.8	-0.6	-1.0	-1.1	-0.9	1.7	3.5	3.8	3.6	3.3	3.8	5.2
	-1.5	0.0	-0.1	0.5	0.5	0.3	0.5	1.2	1.7	2.1	1.5	1.8	3.0	2.4	6.0
	0.6	0.4	0.0	-0.3	-1.9	-1.3	-1.0	-0.4	1.2	1.8	0.7	0.7	0.4	0.3	4.2
	-0.9	-0.2	-0.5	-0.2	-0.7	-0.6	-0.4	0.0	1.6	2.5	1.9	2.0	2.2	2.2	5.0
[11]	-1.6	-1.4	-0.7	-0.7	-1.4	-1.1	-1.8	0.4	2.7	3.1	3.3	3.6	4.8	2.9	8.0
	-1.5	-1.3	-0.7	-0.3	-0.1	0.5	0.8	1.4	2.4	2.3	2.3	3.5	3.7	2.7	8.0
	0.9	0.1	-0.1	-1.8	-1.5	-1.6	-1.2	0.2	1.5	0.9	0.8	1.2	0.5	2.2	4.7
	-0.8	-0.9	-0.5	-1.0	-1.0	-0.8	-0.7	0.7	2.1	2.1	2.1	2.8	3.0	2.5	6.1
[12]	-1.6	-1.5	-1.2	-1.0	-0.1	0.1	0.2	0.0	-0.6	0.9	0.8	2.6	3.4	3.0	5.7
	-3.4	-2.0	-1.4	-0.7	-0.3	0.9	0.1	1.1	2.7	2.9	1.6	2.2	2.6	2.8	7.1
	-1.2	-0.5	-0.2	0.0	-0.5	-1.0	-0.6	0.0	-0.3	1.0	0.9	0.9	1.7	0.7	3.6
	-1.9	-1.3	-0.9	-0.6	-0.2	-0.1	0.0	0.4	0.6	1.6	1.0	1.9	2.6	2.2	5.3
[13]	-1.4	-1.2	-0.6	-0.4	-0.9	-0.6	-0.8	0.0	0.9	1.3	1.6	2.3	3.1	2.1	5.1
	-1.4	-1.1	-0.4	-0.4	-0.2	0.3	0.4	0.7	1.5	1.3	1.6	2.0	2.2	1.6	5.0
	1.3	1.1	0.7	-0.1	-0.8	-0.9	-1.1	-0.4	0.1	0.3	0.2	0.4	0.2	1.0	2.9
	-0.6	-0.4	0.0	-0.3	-0.6	-0.5	-0.5	0.1	0.8	1.0	1.2	1.6	2.9	1.6	3.6
[14]	-2.3	-1.9	-1.1	-1.1	0.2	-0.2	0.0	0.0	0.6	-0.4	-0.1	0.7	1.1	1.4	4.3
	-3.3	-2.7	-1.7	-1.0	-1.0	-0.8	-0.8	-1.0	0.1	0.1	0.3	1.7	2.2	1.8	6.0
	-1.4	-1.2	-1.7	-1.3	-0.4	-0.3	-0.4	0.0	0.5	0.9	0.2	0.5	0.6	0.1	3.0
	-2.3	-1.8	-1.4	-1.0	-0.5	-0.3	-0.4	-0.5	0.0	0.2	0.1	0.9	1.2	1.1	4.0
[15]	-1.1	-0.6	-0.5	-0.2	-0.1	-0.4	-0.3	-0.2	0.7	1.6	1.6	1.5	1.8	2.2	4.0
	-0.7	-0.1	-0.4	0.2	0.5	0.5	0.5	0.4	0.8	1.2	1.0	1.1	1.2	1.3	3.0
	0.6	0.8	0.2	-0.2	-1.2	-1.0	-0.8	-0.6	0.2	0.7	0.4	0.4	0.6	0.4	2.1
	-0.5	-0.1	0.3	0.0	-0.2	-0.3	-0.2	-0.2	0.6	1.2	1.0	1.1	1.2	1.3	2.6
[16]	-1.0	-0.8	-0.1	0.2	0.1	0.2	0.2	0.3	0.0	0.4	1.4	1.6	1.7	1.4	3.8
	-0.7	-0.7	-0.1	0.4	0.9	1.3	0.9	0.5	0.6	0.6	0.8	0.9	0.5	0.5	2.7
	0.3	0.4	0.4	0.1	0.0	-0.4	-1.0	-0.4	-0.2	0.0	0.7	0.7	0.2	0.4	2.0
	-0.5	-0.3	0.1	0.1	0.2	0.5	0.1	0.1	0.1	0.3	0.9	1.1	0.8	0.8	2.6

TABLE 39

DISTURBED DAILY GEOMAGNETIC VARIATIONS OF DECLINATION D (IN MINUTES)

YEAR OF LOW MAGNETIC ACTIVITY

Observatory and observation year	World time	1	2	3	4	5	6	7	8	9	10
Bukhta Tikhaya 1944 [1]	Winter	4.1	22.4	21.1	20.3	14.9	15.9	10.4	2.9	6.9	4.1
	Equinox	13.9	17.5	22.7	23.0	35.3	18.0	28.8	1.3	−12.6	9.0
	Summer	4.2	0.7	0.4	0.6	17.8	4.6	28.8	9.1	13.8	20.2
	Year	7.4	13.4	14.7	14.9	15.8	12.9	12.8	4.5	2.7	11.3
Mys Chelyuskin 1944 [2]	Winter	−7.8	−12.2	33.8	10.7	26.4	61.5	36.7	35.4	18.6	−10.1
	Equinox	−4.4	20.0	32.2	32.0	24.6	59.0	50.6	47.9	25.9	17.9
	Summer	−17.1	1.5	3.8	19.8	29.6	40.8	66.2	66.1	22.9	17.8
	Year	0.9	3.1	24.0	20.7	26.6	53.4	50.8	50.1	22.8	8.7
Dikson, 1944 [3]	Winter	44.2	32.4	26.1	37.6	14.6	13.6	−3.0	−17.0	−21.3	−24.4
	Equinox	65.8	43.9	43.3	67.3	41.7	41.7	21.0	7.6	−24.5	−29.7
	Summer	22.3	41.3	40.4	40.7	45.1	44.4	21.5	18.1	10.9	3.2
	Year	44.0	39.0	36.4	48.2	33.5	33.5	13.4	2.8	−11.4	−16.9
Matochkin Shar, 1944 [4]	Winter	12.9	20.4	14.3	14.1	10.9	−2.7	−9.2	−13.5	−13.0	−15.8
	Equinox	11.7	32.4	22.9	23.5	27.6	21.4	−0.9	−13.2	−12.2	−10.2
	Summer	13.8	24.3	31.1	30.8	12.0	7.1	−0.4	−0.2	−8.5	−7.1
	Year	18.2	29.6	23.3	22.4	10.7	4.7	−6.2	−12.2	−13.1	−14.0
Tiksi, 1944 [5]	Winter	−0.8	3.3	9.6	5.1	15.1	10.2	−1.8	−7.3	−6.7	−5.2
	Equinox	6.6	0.9	4.2	0.8	0.7	0.4	−1.5	−2.5	−2.3	−4.8
	Summer	9.6	6.6	0.4	1.3	0.6	0.5	1.1	2.6	2.8	−0.7
	Year	5.2	3.7	4.9	3.9	4.7	3.9	0.5	−2.3	−2.1	−3.6
Uelen, 1943 [6]	Winter	2.8	−1.0	−0.8	0.3	1.8	3.8	0.4	1.1	−2.8	−4.5
	Equinox	0.4	4.9	−3.4	−1.2	4.5	6.0	1.3	1.5	−2.1	−4.9
	Summer	−2.6	2.6	0.4	−1.1	−3.0	−0.2	3.8	2.4	0.3	−1.3
	Year	0.1	2.2	−1.3	−0.7	1.2	3.1	2.1	1.2	−1.5	−3.6
Yakutsk, 1944 [7]	Winter	−0.9	0.4	−2.4	0.1	0.2	−0.1	−2.2	−4.2	−3.9	−1.8
	Equinox	0.0	1.4	0.7	0.4	0.9	1.3	0.8	3.4	3.6	−4.7
	Summer	0.9	1.0	0.9	1.7	1.4	0.7	−0.3	−0.6	−0.7	−1.8
	Year	0.1	1.1	0.9	0.8	0.6	0.6	−0.7	−2.3	−2.7	−2.7
Sverdlovsk, 1944 [8]	Winter	−1.2	−2.4	−2.7	−2.7	−2.5	−3.1	−3.8	−4.2	−5.0	−3.9
	Equinox	2.2	0.1	−1.6	−3.2	−1.7	−3.2	−2.8	−3.8	−2.6	−1.7
	Summer	0.5	−0.3	−0.6	−0.8	−1.3	0.6	−0.8	−1.1	−1.8	−1.1
	Year	0.5	−0.8	−1.6	2.3	−1.9	−2.3	−2.5	−3.0	−3.2	2.2
Kazan', 1944 [9]	Winter	−1.5	−2.3	−1.7	−2.0	−2.7	−3.2	−3.7	−4.4	−3.6	−2.9
	Equinox	0.7	−1.2	−2.0	−0.8	−1.8	−2.0	−3.2	−2.0	−1.5	−0.7
	Summer	−0.2	−0.7	−0.5	−0.6	−0.3	−0.2	−0.2	−0.8	−0.9	−1.5
	Year	−0.2	−1.4	−1.4	−1.2	−1.6	−1.8	−2.4	−2.3	−2.0	−1.8
Irkutsk, 1944 [10]	Winter	0.1	0.5	−0.4	−1.1	−1.8	−2.2	−2.0	−1.4	−2.0	−2.2
	Equinox	0.9	0.7	0.9	0.8	0.2	−1.4	−3.1	−1.6	−3.1	−1.9
	Summer	−0.2	0.8	0.6	0.5	0.2	0.0	−0.2	−0.8	−0.6	−0.5
	Year	0.4	0.6	0.3	0.0	−0.5	−1.3	−1.9	−1.2	−1.9	−1.5
Vladivostok, 1944 [11]	Winter	0.0	0.5	−0.4	0.4	−0.1	−0.3	−0.9	−1.2	−1.3	−1.0
	Equinox	0.4	0.6	0.2	0.1	0.1	−0.1	−0.2	−1.0	−1.5	−1.8
	Summer	0.2	0.1	0.1	0.4	0.4	0.4	0.1	−0.2	−0.5	0.1
	Year	0.2	0.5	0.1	0.5	0.4	0.2	−0.1	−0.5	−0.8	−1.2
Tbilisi, 1944 [12]	Winter	0.1	0.0	−0.6	−1.6	−1.0	−1.3	−1.5	−1.7	−1.7	−1.6
	Equinox	0.3	−0.5	−0.5	−1.1	−0.7	−0.9	−1.4	−1.2	−1.0	−0.6
	Summer	−0.3	−0.3	−0.4	−0.7	−0.3	−0.4	−0.2	−0.4	−0.2	−0.2
	Year	0.0	−0.3	−0.5	−1.0	−0.6	−0.8	−0.9	−0.9	−0.9	−0.4
Tashkent, 1944 [13]	Winter	0.5	−0.5	−1.0	−1.2	−1.3	−1.3	−1.3	−1.4	−1.4	−1.7
	Equinox	0.8	0.8	0.2	−0.5	−0.6	−1.3	−1.3	−1.4	−1.7	−1.2
	Summer	0.6	0.4	0.2	0.1	0.0	−0.3	−0.2	0.1	−0.6	−0.9
	Year	0.6	0.2	−0.2	−0.5	−0.6	−1.0	−1.0	−0.9	−1.3	−1.3

		11	12	13	14	15	16	17	18	19	20	21	22	23	Amplitude
[1]	14.7	11.1	23.4	19.4	2.2	−14.9	−22.6	−16.4	−32.9	−51.1	−27.4	−13.1	−21.1	6.2	74.5
	32.1	35.4	32.7	28.1	−11.7	−16.6	−41.8	−30.5	−68.0	−51.8	−50.0	−34.2	−14.0	−9.7	103.4
	13.8	23.8	28.4	22.8	6.6	−13.6	−22.1	−24.6	−39.9	−54.6	−28.2	−10.4	−1.8	0.0	83.4
	20.1	23.4	28.2	23.4	6.7	−15.0	−28.9	−24.2	−46.9	−52.5	−35.3	−19.2	−12.1	5.3	80.7
[2]	−18.6	−25.9	−23.8	−27.6	−19.6	−25.6	−6.1	−0.7	2.4	−3.7	−26.5	−29.6	−27.5	−6.8	91.1
	−9.7	−24.4	−25.4	−15.8	−12.8	−12.9	−4.5	−11.4	−19.6	−21.2	−28.4	−35.3	−17.4	−35.9	106.4
	5.3	1.4	−14.8	−15.0	−22.0	−25.1	−21.6	−28.8	−11.4	−27.7	−34.6	−15.1	−26.0	−18.5	100.8
	−7.5	−16.3	−21.3	−19.5	−18.1	−21.2	−10.7	−13.7	−9.5	−18.0	−13.9	−26.7	−33.6	−20.5	87.0
[3]	−25.6	−27.1	−24.6	−32.2	−33.6	−33.8	−37.4	−15.4	5.0	7.1	12.3	31.3	44.8	26.9	82.2
	−23.4	−25.8	−29.5	−33.3	−31.0	−46.8	−44.0	−48.4	−41.9	−24.4	−14.7	1.5	27.2	55.7	115.7
	−6.9	−10.4	−22.3	−30.3	−44.0	−51.7	−48.0	−47.8	−36.4	−12.0	−12.3	5.6	10.5	16.0	96.8
	−18.4	−20.8	−24.7	−31.9	−36.1	44.1	−43.1	−37.2	−24.5	−9.8	−5.0	12.7	27.3	32.6	92.3
[4]	−14.4	−16.1	−16.5	−14.5	17.0	−8.4	3.8	8.3	5.2	9.3	10.3	−3.2	18.3	15.7	36.9
	−10.6	−9.7	−9.3	−18.2	−18.3	−23.5	−23.6	−13.1	−14.9	−15.7	12.2	0.0	9.9	15.6	56.0
	−10.7	−12.3	−17.9	−22.0	−18.2	−19.3	−14.5	−4.1	−9.5	−4.3	0.0	3.7	3.9	22.7	53.1
	−15.3	−15.8	−16.6	−20.0	−19.2	−16.5	−10.5	−2.7	−5.1	−1.9	10.8	6.4	17.1	24.9	49.7
[5]	−6.7	−7.9	−7.7	−6.7	−7.2	−3.0	0.9	−4.2	−1.8	1.3	6.5	7.2	6.7	1.0	23.0
	−4.5	−0.4	−3.1	−3.2	−6.6	−8.7	−10.1	−7.9	−5.8	−5.2	9.2	13.8	17.1	13.6	27.2
	−3.0	−1.7	−0.7	−1.3	−2.3	−2.3	−3.1	−10.4	−11.5	−10.9	−5.5	−1.8	15.0	12.0	26.5
	−4.8	−3.5	−4.0	−3.9	5.6	−1.9	−4.2	−7.6	−6.5	5.0	3.4	6.4	13.0	8.8	20.6
[6]	−4.5	−4.7	−3.9	−3.8	−2.7	1.4	0.4	0.1	0.1	5.4	6.4	5.7	−0.3	4.4	11.1
	−6.5	−5.2	−1.7	−1.7	−1.7	−1.4	0.9	0.7	0.4	2.1	5.0	2.7	2.3	−1.8	12.5
	−1.3	−2.3	−0.8	−0.7	1.0	0.6	1.1	1.7	−0.9	1.1	0.9	1.1	−1.3	−0.9	6.8
	−4.0	−4.0	−2.1	−2.1	−1.2	0.8	0.6	0.9	−0.5	2.8	4.1	3.2	0.3	0.5	8.1
[7]	−2.5	−2.0	−1.5	−1.0	0.0	−0.5	−0.6	0.6	2.5	4.3	3.9	5.9	2.0	−0.4	10.1
	−5.0	−3.8	−4.1	−1.5	−0.2	−0.2	0.1	1.8	2.9	2.8	5.6	3.3	1.4	2.8	10.6
	−1.7	−1.4	−1.6	−2.1	1.9	−2.2	−1.8	−1.1	−1.5	−1.4	3.2	2.1	1.4	1.4	5.3
	−3.2	−2.3	−2.4	1.6	−0.8	−1.0	−0.9	0.4	2.2	2.8	1.3	3.8	1.5	1.3	7.5
[8]	−2.8	−1.8	−1.4	−0.8	0.1	0.4	2.1	5.2	7.1	6.0	5.8	4.6	3.0	2.4	12.1
	0.4	0.5	1.2	1.2	0.3	0.7	1.2	0.4	1.9	1.7	2.8	2.1	2.1	2.0	6.6
	−0.9	−0.9	−0.4	−0.2	−0.2	0.4	0.2	0.6	1.6	1.7	2.1	1.5	1.8	1.1	3.9
	1.4	−0.7	0.3	0.1	0.1	0.5	1.3	2.0	3.5	3.2	3.9	2.8	2.5	2.0	6.1
[9]	−2.2	−1.8	−1.2	−0.3	0.2	1.1	3.5	5.6	5.1	6.8	5.6	3.1	2.5	−0.2	11.2
	−0.4	0.3	0.5	0.1	0.2	0.5	−0.6	0.7	1.9	1.5	2.3	2.5	2.2	2.4	5.7
	−1.0	−0.5	−0.3	−0.5	−0.3	−0.3	0.4	1.2	1.4	1.7	1.6	1.3	1.0	0.7	3.2
	−1.3	−0.7	−0.4	−0.3	0.0	0.4	1.2	2.5	2.8	3.3	3.3	2.3	2.0	1.0	5.7
[10]	−2.1	−1.7	−0.8	−0.3	0.1	0.5	1.1	1.8	1.5	3.1	4.1	2.2	1.4	1.4	6.3
	−2.2	−1.2	−0.5	0.3	0.4	0.7	1.2	1.1	1.8	1.0	1.1	1.9	0.5	1.1	5.0
	−0.7	−1.0	−1.0	−1.1	−0.9	0.7	0.0	0.1	0.8	0.9	0.8	0.8	0.7	0.5	2.0
	−1.5	−1.2	−0.7	−0.4	0.0	0.2	0.8	1.0	1.4	1.6	1.9	1.6	1.0	1.1	3.8
[11]	−1.0	−0.8	−0.6	−0.3	0.1	0.1	0.3	0.6	0.8	1.5	1.0	1.5	1.1	0.6	2.8
	−1.8	−1.3	−0.8	0.1	0.3	0.1	0.3	0.6	0.9	1.1	1.2	0.9	0.6	0.8	3.0
	−0.3	−0.1	−0.3	−0.3	−0.3	−0.8	−1.1	−0.7	0.2	0.2	0.5	0.4	0.6	0.5	1.7
	−1.3	−1.0	−1.0	−0.4	−0.1	−0.3	−0.2	0.2	0.6	0.8	1.0	0.9	0.8	0.7	2.3
[12]	−1.2	−0.6	−0.5	0.0	0.0	0.4	1.0	0.8	1.7	3.0	2.5	2.0	1.7	0.6	4.7
	−0.3	0.1	0.1	−0.1	0.2	0.6	0.0	0.3	0.6	0.7	1.2	1.4	1.3	0.9	2.8
	−0.4	−0.1	−0.2	−0.2	−0.1	−0.5	−0.2	0.4	0.4	0.8	0.6	0.3	0.3	0.2	1.5
	−0.5	0.0	0.1	−0.1	0.0	0.2	0.1	0.5	0.9	1.4	1.5	1.5	1.1	0.6	2.4
[13]	[illegible]	−0.8	−0.2	0.0	0.3	0.4	0.4	1.0	2.0	2.6	1.7	1.9	1.3	0.9	4.3
	−0.7	0.0	0.6	0.9	0.8	0.5	0.6	0.4	−0.1	0.5	0.4	0.2	0.7	0.7	2.6
	−0.7	−0.7	−0.4	−0.2	−0.1	0.0	0.3	0.1	0.4	0.5	0.7	0.6	0.4	0.6	1.5
	−1.0	0.5	0.0	0.2	0.3	0.4	0.4	0.5	0.8	1.2	1.0	1.2	0.8	0.7	2.5

TABLE 40

DISTURBED DAILY GEOMAGNETIC VARIATIONS OF HORIZONTAL COMPONENT H (IN GAMMAS). YEAR OF HIGH MAGNETIC ACTIVITY

Observatory and observation year	World time	1	2	3	4	5	6	7	8	9	10
Bukhta Tikhaya 1937 [1]	Winter	12	23	13	14	11	−3	14	2	24	20
	Equinox	13	30	19	19	26	34	14	−1	3	23
	Summer	−15	0	25	25	37	31	23	31	26	49
	Year	3	17	19	20	25	21	16	12	18	31
Dikson, 1937 [2]	Winter	−101	−147	−122	−120	−88	−87	−60	−23	3	22
	Equinox	−119	−133	−97	−54	−19	−16	−23	−1	20	32
	Summer	−99	−106	−112	−151	−118	−116	−47	22	36	54
	Year	−106	−130	−121	−118	−92	−91	−59	−22	7	29
Matochkin Shar 1937 [3]	Winter	−119	−72	−40	−39	−41	−22	−4	15	22	37
	Equinox	−94	−115	−101	−102	−113	−34	−12	1	28	44
	Summer	−127	−138	−150	−151	−106	−126	−71	−33	−1	54
	Year	−113	−114	−98	−97	−87	−60	−30	−6	16	47
Tiksi, 1947 [4]	Winter	−112	−157	−165	−173	−170	−145	−70	1	6	32
	Equinox	−116	−158	−200	−198	−206	−181	−91	−28	−24	−14
	Summer	−72	−129	−139	−127	−164	−134	−91	−84	−88	−31
	Year	−100	−148	−168	−163	−180	−154	−88	−36	−36	−5
Uelen, 1937 [5]	Winter	−21	−24	−70	−124	−82	−71	−88	−100	−72	−25
	Equinox	−66	−81	−131	−131	−108	−97	−55	−28	−16	−16
	Summer	−18	−57	−89	−118	−143	−141	−98	−79	−60	−41
	Year	−35	−54	−97	−124	−112	−103	−80	−69	−48	−27
Srednikan, 1948 [6]	Winter	−19	−33	−54	−38	−25	−2	−1	10	12	13
	Equinox	−9	−27	−20	−29	−24	−10	−9	1	3	−3
	Summer	6	−9	−14	−18	−22	−32	−21	−3	−12	−10
	Year	−7	−23	−30	−29	−24	−15	−11	2	−1	−2
Yakutsk, 1948 [7]	Winter	−23	−40	−40	−35	−21	−5	6	11	13	11
	Equinox	−13	−16	−20	−24	−16	−10	1	2	−1	−10
	Summer	−3	−3	−10	−20	−22	−26	−24	−21	−15	−9
	Year	−7	−15	−20	−23	−16	−17	−9	−5	−6	−6
Leningrad, 1948 [8]	Winter	−13	−11	−5	3	4	4	6	6	3	4
	Equinox	−4	−14	−15	−18	4	−2	−21	−25	−19	−8
	Summer	−10	−19	−8	−9	−11	−10	−14	−15	−25	−26
	Year	−8	−13	−11	−8	−1	−4	−10	−12	−14	−10
Sverdlovsk, 1948 [9]	Winter	2	0	−1	1	2	4	4	6	6	8
	Equinox	12	6	6	5	0	1	5	−2	−12	−17
	Summer	7	3	3	0	0	−3	−1	−3	−8	−12
	Year	7	3	2	3	0	2	2	0	−5	−7
Kazan', 1948 [10]	Winter	2	1	3	3	5	5	6	6	7	9
	Equinox	7	7	8	4	4	6	2	−10	−15	−11
	Summer	4	4	5	2	1	1	−2	−6	−11	−13
	Year	5	3	5	2	4	4	3	−3	−6	−6
Moscow, 1948 [11]	Winter	0	0	4	6	6	7	9	9	10	10
	Equinox	9	7	2	3	8	3	−9	−17	−9	−5
	Summer	4	4	3	5	3	1	−3	−7	−18	−21
	Year	4	4	4	5	6	3	−2	−5	−7	−5
Irkutsk, 1948 [12]	Winter	−8	−11	−8	4	5	4	3	5	5	7
	Equinox	12	9	15	16	15	14	3	3	0	4
	Summer	10	6	9	6	7	3	2	1	−2	1
	Year	6	2	5	9	9	7	6	3	1	3
Odessa, 1948 [13]	Winter	5	7	6	7	9	9	11	13	8	7
	Equinox	11	9	16	12	12	11	7	3	1	3
	Summer	9	10	4	7	6	6	3	1	−7	−11
	Year	9	8	9	9	9	10	8	5	1	−1
Vladivostok, 1947 [14]	Winter	−13	−6	5	7	9	11	12	12	5	10
	Equinox	−1	−1	4	14	10	14	7	3	8	16
	Summer	5	7	12	16	14	11	7	4	1	4
	Year	−3	0	6	12	10	13	9	5	6	11
Tbilisi, 1948 [15]	Winter	7	6	5	10	10	11	13	14	16	9
	Equinox	11	13	14	6	7	4	3	−6	−6	−1
	Summer	9	10	11	9	13	12	10	4	1	−10
	Year	10	11	11	11	12	12	11	6	4	1
Tashkent, 1948 [16]	Winter	6	6	8	6	6	7	10	10	12	12
	Equinox	12	19	14	14	14	14	12	13	9	1
	Summer	14	13	12	12	10	12	10	10	9	4
	Year	5	11	11	11	10	11	11	11	11	5

	11	12	13	14	15	16	17	18	19	20	21	22	23		Amplitude
[1]	13	13	−4	−24	−38	−37	−29	−67	−12	19	9	4	26	3	93
	6	−1	−11	−50	−51	−52	−70	−44	−9	20	27	34	5	16	104
	31	−2	−19	−40	−41	−51	−49	−28	−12	−14	−22	−10	8	10	88
	17	3	−11	−37	−43	−47	−51	−46	−11	7	6	9	12	10	82
[2]	40	70	78	85	117	131	127	104	61	23	19	−29	−72	−63	278
	49	63	73	84	110	96	111	95	29	−13	−23	−80	−152	−82	263
	69	80	85	107	118	99	95	61	26	30	−2	−21	−57	−65	269
	49	78	88	94	121	130	124	104	57	21	14	−35	−79	−69	260
[3]	43	50	73	89	103	111	89	38	38	−24	−121	−58	−65	−99	232
	60	90	90	108	100	114	98	83	47	20	−37	−58	−100	−96	229
	83	82	132	171	174	191	182	131	108	81	34	−52	−79	−137	342
	63	74	99	124	128	132	111	72	45	6	−56	−56	−81	−110	246
[4]	36	40	50	71	86	90	110	170	176	156	90	−4	−43	−79	349
	22	58	76	103	152	206	229	214	123	79	79	−3	−42	−85	435
	−12	−2	49	78	106	186	193	145	199	121	41	−5	−13	−35	363
	15	39	58	85	115	153	178	177	166	118	71	−4	−33	−67	346
[5]	−6	25	39	39	39	43	47	52	59	59	75	86	82	50	210
	6	19	45	47	56	63	69	64	87	82	83	79	52	−22	218
	−19	1	15	16	37	56	87	118	139	132	103	103	36	8	282
	−7	16	34	34	44	54	68	77	95	91	87	89	57	12	219
[6]	18	16	20	20	15	15	11	7	11	2	8	3	−7	−1	74
	−4	5	10	12	11	15	15	28	27	24	8	1	−12	−18	57
	−6	−9	−4	3	3	20	35	24	24	23	15	12	4	−5	67
	4	6	10	13	11	17	21	20	21	16	10	5	−6	−9	50
[7]	14	14	17	16	14	13	7	8	8	8	9	4	2	−9	57
	1	9	8	4	5	5	15	20	21	22	4	1	−4	−3	46
	−5	−8	−4	−5	0	8	19	32	32	33	24	11	5	8	59
	−2	1	6	3	6	8	13	19	19	22	16	10	2	3	45
[8]	5	5	5	4	7	6	8	5	6	−4	−13	−12	−13	−17	25
	−4	−3	8	13	13	33	20	17	16	7	11	−2	−2	−10	58
	−10	−3	6	8	16	21	27	27	22	20	12	13	0	−14	53
	−2	0	5	8	12	21	18	17	16	8	4	0	−4	−12	35
[9]	10	8	6	3	2	1	−1	−4	−9	−14	−9	−9	−14	−10	24
	−10	−5	−2	−6	−6	−5	−5	8	4	5	4	7	6	7	29
	−15	−19	−14	−9	−4	−2	3	7	10	11	11	11	8	12	31
	−5	−6	−3	−5	−2	−2	0	4	2	1	2	3	0	3	14
[10]	8	8	4	3	3	−1	−3	−9	−13	−12	−11	−12	−7	2	22
	−8	−4	−9	−9	−7	−6	7	4	4	4	7	6	9	12	27
	−16	−12	−11	−9	−4	−1	4	8	7	10	10	9	14	10	30
	−5	−3	−6	−4	−3	−2	3	1	−1	−1	−2	−1	5	8	14
[11]	8	4	3	2	0	−3	−7	−14	−16	−15	−16	−9	1	2	26
	−4	−11	−8	−9	−12	5	1	3	2	7	4	5	2	6	26
	−14	−11	−9	−7	−4	1	5	7	9	12	10	16	12	4	37
	−3	−6	−5	−5	−4	2	0	−1	−2	2	−1	5	4	4	13
[12]	9	8	9	10	8	1	−4	−3	−6	−6	−6	−9	−12	−7	22
	3	0	−14	−15	−16	−17	−19	−15	−16	−9	1	1	3	5	35
	0	−6	−7	−12	−18	−14	−13	−1	0	0	6	7	6	9	28
	4	1	−4	−7	−10	−11	−11	−8	−7	−5	1	−1	0	3	20
[13]	4	4	2	0	−8	−4	−9	−22	−19	−16	−17	−10	1	6	35
	−3	−9	−12	−16	−17	−11	−11	−12	−10	−1	1	3	7	9	33
	−10	−12	−14	−13	−13	−8	−5	−6	−1	6	7	13	12	8	27
	−3	−5	−7	−10	−12	−8	−9	−12	−10	−4	−4	1	5	7	22
[14]	14	10	7	8	6	1	1	−1	−7	−12	−11	−19	−17	−10	33
	16	14	17	11	7	−9	−15	−10	−18	−27	−24	−21	−15	−8	43
	0	−2	−6	−11	−8	−5	1	−8	−17	−15	−12	−7	2	2	33
	9	−3	5	3	2	−4	−5	−7	−15	−18	−16	−15	−9	−5	31
[15]	7	1	1	−3	−9	−10	−17	−24	−20	−18	−18	−12	4	40	40
	−4	−8	−12	−14	−17	−13	−8	−5	−1	1	9	8	10	14	31
	−16	−14	−15	−3	−14	−13	−8	−9	−8	0	7	8	14	13	30
	−3	−5	−11	−11	−14	−14	−11	−12	−13	−8	−2	−2	4	11	26
[16]	12	11	11	6	1	−1	−3	−9	−10	−17	−19	−15	−13	−14	31
	−5	−11	−9	−10	−17	−22	−26	−21	−9	−7	−3	−1	8	10	45
	−2	−12	−20	−19	−19	−16	−16	−12	−5	−3	−1	4	9	1	31
	1	−4	−6	−8	−12	−13	−15	−14	−9	−9	−7	−5	1	−1	25

TABLE 41

DISTURBED DAILY GEOMAGNETIC VARIATIONS OF HORIZONTAL COMPONENT H

(IN GAMMAS) YEAR OF LOW MAGNETIC ACTIVITY

Observatory and observation year	World time	1	2	3	4	5	6	7	8	9	10
Bukhta Tikhaya 1944 [1]	Winter	29	8	8	9	14	20	16	38	42	47
	Equinox	19	30	22	22	5	34	0	27	58	51
	Summer	7	18	24	22	9	−3	−10	22	14	22
	Year	16	17	16	19	11	19	4	30	39	41
Mys Chelyuskin 1944 [2]	Winter	−72	−18	−12	12	16	−31	−22	−21	−15	18
	Equinox	−1	−26	−33	−31	−14	−26	−38	−40	−23	0
	Summer	−16	−19	−33	−8	−28	−26	−50	−53	−20	−10
	Year	−30	−22	−27	−10	−9	−28	−38	−37	−19	3
Dikson, 1944 [3]	Winter	−124	−77	−65	−68	−7	−4	19	32	33	50
	Equinox	−123	−100	−64	−117	−67	−67	−43	−18	25	50
	Summer	−70	−104	−89	−86	−68	−66	−19	−23	−12	−4
	Year	−105	−94	−73	−93	−48	−45	−14	−3	15	32
Matochkin Shar 1944 [4]	Winter	−71	−72	−40	−39	−25	0	4	13	33	54
	Equinox	−56	−102	−104	−101	−63	−40	−5	28	29	44
	Summer	−73	−71	−87	−86	−55	−44	−32	−27	0	10
	Year	−67	−82	−78	−74	−48	−28	−11	5	21	37
Tiksi, 1944 [5]	Winter	−229	−241	−146	−140	−122	−76	3	19	23	36
	Equinox	−135	−179	−185	−173	−102	−31	−17	3	5	26
	Summer	−116	−122	−102	−81	−55	−47	−22	−14	−14	−6
	Year	−154	−177	−142	−130	−89	−48	−13	0	3	16
Uelen, 1943 [6]	Winter	−81	−131	−123	−176	−138	−113	−96	−39	9	16
	Equinox	−185	−118	−165	−180	−154	−78	−53	−23	−17	−39
	Summer	−156	−108	−120	−149	−103	−164	−51	−16	−18	−14
	Year	−141	−119	−137	−167	−132	−98	−65	−24	−8	−11
Yakutsk, 1944 [7]	Winter	3	−2	−2	−5	−2	−1	2	11	12	11
	Equinox	−8	−2	−5	−1	−3	0	3	−2	3	7
	Summer	1	−3	0	−3	−1	−2	−2	−1	−4	−1
	Year	−1	−2	−2	−2	−1	−1	4	3	2	5
Sverdlovsk, 1944 [8]	Winter	5	−2	1	4	4	5	6	6	5	3
	Equinox	6	5	2	2	1	−1	−5	−1	−3	3
	Summer	6	3	3	0	0	0	2	−1	−2	−2
	Year	5	2	1	3	1	2	1	2	0	1
Kazan', 1944 [9]	Winter	−2	4	7	4	6	6	10	5	5	3
	Equinox	7	6	5	3	0	0	1	1	0	−2
	Summer	5	4	3	2	1	2	0	1	0	−5
	Year	4	4	5	3	3	3	3	2	2	−2
Irkutsk, 1944 [10]	Winter	4	−4	−1	−1	0	5	8	7	7	8
	Equinox	8	8	6	8	5	4	2	5	2	−3
	Summer	5	4	5	7	5	3	0	1	0	−2
	Year	6	3	3	4	4	4	4	4	3	2
Vladivostok 1944 [11]	Winter	−6	2	3	1	0	2	−1	3	6	11
	Equinox	3	2	5	6	7	7	6	5	5	3
	Summer	4	5	6	6	4	5	6	5	1	3
	Year	1	4	5	4	3	4	3	5	5	6
Tbilisi, 1944 [12]	Winter	11	10	12	10	13	13	13	16	15	10
	Equinox	3	7	7	2	7	2	4	3	8	2
	Summer	10	9	7	9	6	8	10	6	3	−5
	Year	9	9	10	7	9	7	8	7	7	0
Tashkent, 1944 [13]	Winter	−3	0	2	6	8	8	9	10	10	13
	Equinox	7	8	10	10	10	7	6	3	6	6
	Summer	5	6	8	6	5	5	4	3	5	6
	Year	3	4	6	8	8	8	6	6	8	9

POOR ORIGINAL

	1	11	12	13	14	15	16	17	18	19	20	21	22	23	Amplitude
[1]	29	27	−10	−16	−19	−43	−60	−80	−4	−9	−96	−9	39	3	143
	24	−13	−47	−80	−62	−42	−27	−48	0	−2	13	8	5	−1	138
	45	48	11	−25	−28	−29	−27	−38	−40	−13	−8	−5	−22	−1	88
	34	21	−14	−40	−36	−39	−34	−56	−15	−9	−31	−3	5	−1	97
[2]	35	67	81	85	102	93	64	31	−12	−76	−110	−61	−76	−76	212
	26	63	77	98	85	50	18	−17	−39	−47	−39	−25	−17	5	145
	1	4	34	66	92	103	93	61	−1	−24	−33	−65	−41	−20	168
	22	45	65	84	93	83	59	25	−17	−50	−61	−35	−45	−31	154
[3]	63	78	88	109	121	128	144	92	3	−41	−93	−148	−191	−106	335
	54	77	99	108	101	138	143	143	95	32	−83	−62	−158	−163	306
	18	32	61	89	126	130	131	118	72	5	−25	−72	−69	−59	235
	45	63	82	102	117	132	138	118	57	−2	−68	−107	−140	−109	278
[4]	61	85	103	119	133	143	76	19	−31	−105	−178	−101	−98	−84	321
	71	87	88	114	129	126	117	78	9	−5	−95	−129	−121	−94	258
	30	52	93	113	123	117	97	51	25	−25	−45	−48	−41	−75	210
	54	75	96	116	128	130	97	50	1	−47	−107	−103	−87	−85	237
[5]	41	46	61	72	86	106	120	144	136	126	78	6	63	−93	385
	34	51	58	61	80	95	99	104	129	111	101	48	−42	−145	314
	−4	1	12	22	44	67	97	119	114	103	80	30	−19	−83	241
	22	30	41	48	69	88	104	120	125	112	88	30	−39	−109	302
[6]	38	51	51	51	60	64	73	76	86	97	96	82	39	−3	273
	−2	15	23	27	37	54	116	165	142	216	176	136	28	−116	396
	−5	15	24	29	46	71	92	102	124	138	109	117	42	−58	294
	12	29	34	34	46	61	93	113	117	150	126	111	36	−59	317
[7]	10	10	8	5	2	0	−9	−8	−12	−12	−6	−2	0	−4	24
	4	−1	4	1	2	0	0	−5	−1	0	−3	5	2	−2	15
	1	0	−1	0	2	1	1	3	1	2	3	1	1	5	9
	1	1	3	2	3	1	−2	−3	−3	−2	−2	0	3	1	8
[8]	1	0	1	−4	−6	−5	−10	−2	−10	2	1	6	6	1	16
	−3	−7	−8	−2	−3	−6	−4	−2	−4	3	0	9	12	4	20
	−4	−9	−8	−9	−5	−6	−4	1	6	7	7	7	2	4	16
	−2	−5	−5	−4	−5	−6	−7	−2	−2	3	3	7	2	3	14
[9]	2	3	1	−5	−2	−10	−14	−16	−9	−4	2	−2	0	−2	26
	−8	−10	−5	−7	−6	−5	−2	−4	5	−1	6	9	8	7	19
	−9	−8	−9	−5	−7	−5	−3	4	6	6	8	3	4	6	17
	−4	−4	−4	−6	−5	−6	−6	−5	1	1	5	4	3	4	11
[10]	7	7	6	0	−6	−7	−8	−7	−7	−5	−5	−6	−1	2	16
	1	4	6	−2	−10	−15	−11	−14	−9	−4	−1	0	4	3	23
	0	1	−1	−4	−9	−11	−10	−6	−4	−5	−1	6	5	5	18
	3	4	3	−2	−8	−11	−11	−9	−6	−4	−2	0	2	2	17
[11]	14	10	9	10	2	−3	−12	−11	−11	−8	−10	−3	−2	−5	26
	5	5	2	−3	−3	−9	−13	−14	−9	−7	−4	1	0	3	21
	4	3	1	−1	−2	−5	−8	−10	−10	−7	0	−4	−1	5	16
	7	6	4	3	0	−6	−11	−11	−10	−7	−6	−2	−3	0	18
[12]	11	6	5	−2	−5	−20	−23	−34	−29	−20	−8	−12	1	6	50
	0	−4	−6	−7	−9	−8	−8	−8	−2	0	0	0	1	1	16
	−7	−9	−13	−9	−11	−13	−10	−3	−2	−1	3	1	5	8	23
	−1	−4	−5	−6	−9	−13	−12	−14	−9	−5	−1	3	3	6	23
[13]	10	8	5	3	−1	−5	−7	−14	−16	−22	−12	−7	−3	−8	35
	8	2	−7	−13	−15	−17	−18	−12	−7	−6	−1	−2	5	9	28
	1	−2	−6	−10	−11	−9	−9	−12	−5	0	0	1	5	3	20
	6	4	−1	−7	−9	−10	−11	−13	−11	−7	−5	−4	1	2	22

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TABLE 82

DISTURBED DAILY GEOMAGNETIC VARIATIONS OF VERTICAL COMPONENT Z (IN GAMMAS) YEAR OF HIGH MAGNETIC ACTIVITY

Observatory and observation year	World time	1	2	3	4	5	6	7	8	9	10
Bukhta Tikhaya 1937 [1]	Winter	60	56	28	27	28	44	43	12	-10	-39
	Equinox	62	79	101	101	74	56	40	28	6	-28
	Summer	75	91	113	111	145	146	115	84	47	5
	Year	65	74	81	80	83	81	67	41	14	-20
Dikson, 1937 [2]	Winter	99	87	69	75	31	22	13	9	9	13
	Equinox	80	85	118	125	80	78	91	50	38	15
	Summer	93	123	119	96	74	74	62	29	14	19
	Year	89	97	101	98	60	60	56	31	21	17
Matochkin Shar 1937 [3]	Winter	95	107	61	57	28	27	15	9	10	17
	Equinox	94	98	104	97	101	82	65	49	22	16
	Summer	105	114	122	87	81	51	47	45	28	25
	Year	93	101	91	85	74	57	45	37	22	21
Tiksi, 1947 [4]	Winter	106	99	58	36	32	4	8	-35	-35	-19
	Equinox	111	180	168	97	156	72	46	-7	-9	4
	Summer	34	59	59	41	16	6	-38	36	-17	-10
	Year	81	110	91	52	63	35	15	-10	-12	-2
Uelen, 1937 [5]	Winter	-21	5	13	-17	-9	-3	-23	-71	-72	-55
	Equinox	-5	18	20	10	-9	-45	-54	-18	-16	-22
	Summer	2	3	-9	-15	-33	-37	-55	-55	-41	-21
	Year	-8	9	7	-7	-17	-29	-45	-49	-44	-34
Srednikan, 1948 [6]	Winter	-18	-40	-66	-62	-48	-32	-27	-16	-6	6
	Equinox	-23	-37	-43	-47	-50	-48	-38	-31	-17	-8
	Summer	-12	-30	-34	-33	-34	-36	-26	-24	-16	-8
	Year	-18	-36	-48	-47	-44	-39	-30	-24	-12	-3
Yakutsk, 1948 [7]	Winter	-19	-33	-38	-36	-28	-26	-22	-11	-3	0
	Equinox	-23	-33	-42	-47	-52	-44	-37	-23	-20	-13
	Summer	-17	-19	-23	-31	-33	-27	-31	-25	-16	-9
	Year	-20	-28	-34	-39	-38	-32	-30	-20	-12	-7
Leningrad, 1948 [8]	Winter	-36	-33	-33	-25	-24	-20	-16	-14	-11	-8
	Equinox	-22	-26	-67	-66	-44	-40	-36	-26	-13	-6
	Summer	-30	-43	-26	-31	-31	-26	-21	-14	-4	4
	Year	-28	-34	-42	-41	-34	-28	-24	-18	-9	-4
Sverdlovsk, 1948 [9]	Winter	-10	-14	-12	-10	-11	-9	-7	-6	-6	-5
	Equinox	-20	-21	-17	-18	-21	-20	-17	-12	-8	-3
	Summer	-11	-18	-16	-18	-17	-18	-19	-14	-9	-7
	Year	-13	-18	-15	-16	-16	-16	-15	-10	-8	-5
Kazan', 1948 [10]	Winter	-13	-14	-11	-11	-9	-8	-6	-4	-5	-5
	Equinox	-16	-15	-17	-20	-21	-17	-12	-10	-5	-2
	Summer	-14	-11	-16	-14	-16	-17	-13	-11	-9	-4
	Year	-15	-13	-15	-15	-16	-14	-11	-9	-6	-3
Moscow, 1948 [11]	Winter	-10	-10	-15	-15	-13	-12	-11	-10	-10	-7
	Equinox	-15	-18	-24	-27	-21	-18	-13	-10	-6	-3
	Summer	-11	-16	-15	-18	-21	-19	-15	-13	-8	-4
	Year	-13	-16	-18	-19	-18	-15	-12	-11	-8	-4
Irkutsk, 1948 [12]	Winter	-2	-3	-2	-4	-6	-5	-4	-3	-4	-2
	Equinox	-2	-7	-9	-11	-11	-10	-10	-11	-7	-5
	Summer	1	-2	-3	-6	-7	-9	-8	-13	-12	-10
	Year	-1	-4	-1	-6	-8	-9	-8	-9	-7	-5
Odessa, 1948 [13]	Winter	-1	-2	-3	-4	-3	-3	-3	-4	-3	-5
	Equinox	-2	-3	-7	-9	-7	-8	-7	-6	-5	-4
	Summer	-1	-2	-3	-3	-4	-4	-5	-5	-4	-3
	Year	-2	-2	-4	-4	-5	-5	-5	-4	-4	-1
Tbilisi, 1948 [14]	Winter	-1	-2	-2	-3	-3	-3	-2	-3	-2	-1
	Equinox	-3	-2	-3	-4	-6	-6	-5	-4	-4	-1
	Summer	0	0	-2	-1	-4	-5	-5	-3	-3	-3
	Year	-2	-2	-3	-2	-4	-4	-4	-3	-3	-2
Tashkent, 1948 [15]	Winter	3	3	-1	-1	-2	-7	-3	-3	-2	-2
	Equinox	0	-1	-3	-3	-3	-11	-3	-3	-4	-4
	Summer	2	1	0	-2	-2	-4	-4	-2	-2	-1
	Year	2	0	-1	-2	-2	-8	-4	-3	-2	-3

		11	12	13	14	15	16	17	18	19	20	21	22	23	Amplitude
[1]	−66	−61	−79	−84	−76	−65	−32	2	−7	8	56	50	37	63	147
	−49	−68	−72	−99	−109	−87	−52	−40	−25	−19	−8	24	34	57	210
	−72	−94	−141	−136	−143	−137	−129	−74	−41	−39	−20	4	27	67	289
	−62	−74	−98	−106	−109	−98	−71	−37	−25	−17	9	26	32	61	192
[2]	17	18	13	11	5	−36	−72	−107	−115	−95	−83	−46	10	61	214
	−1	−14	−24	−35	−46	−89	−103	−136	−148	−117	−79	−47	15	62	273
	9	−1	−14	−36	−72	−106	−121	−128	−118	−78	−64	−30	9	49	251
	8	1	−7	−20	−37	−76	−99	−124	−127	−97	−76	−41	11	56	228
[3]	19	16	−13	−10	−39	−66	−109	−144	−106	−96	−51	28	65	57	251
	4	−19	−36	−73	−82	−112	−161	−154	−124	−88	−29	26	43	76	265
	18	−1	−30	−74	−117	−133	−131	−134	−103	−77	−38	1	51	70	256
	14	0	−16	−52	−79	−104	−134	−145	−112	−88	−41	16	51	65	246
[4]	−20	−17	−6	−11	−7	−17	−16	−45	−56	−63	−78	−23	−14	78	184
	−12	−30	−25	−24	−25	−73	−144	−198	−169	−143	−63	−42	32	96	378
	−16	−13	25	8	17	−18	−82	−67	−59	−43	−39	6	17	31	141
	−10	−15	3	−4	−6	−33	−78	−102	−94	−83	−59	−21	11	66	212
[5]	−29	−6	13	12	20	24	28	32	40	35	35	33	24	3	112
	−19	−4	5	8	14	16	18	19	13	27	19	17	0	2	81
	−2	17	31	21	22	28	30	40	37	30	21	−1	−4	−4	95
	−18	0	16	13	20	24	26	31	31	31	26	17	8	0	80
[6]	6	9	11	15	17	18	20	27	34	37	39	41	18	8	108
	−8	2	10	14	22	41	44	55	60	60	51	20	−3	−27	107
	−11	−10	−4	−1	6	15	36	52	48	41	41	34	9	1	88
	−5	1	6	9	14	24	34	44	47	45	44	31	8	4	95
[7]	4	4	7	9	10	12	16	20	26	26	32	28	19	4	70
	−1	6	8	11	24	30	37	45	50	55	47	27	1	−5	107
	7	−4	−3	0	7	18	15	38	41	43	40	26	0	−3	76
	−1	1	3	7	14	20	29	35	40	41	39	27	7	−2	80
[8]	−4	−1	5	9	15	24	34	50	52	37	27	11	−12	−33	88
	6	20	31	46	46	54	50	48	46	32	11	−3	−12	−22	121
	8	16	24	27	30	31	27	38	35	24	14	−4	−13	−30	81
	4	12	20	26	31	35	37	46	44	31	17	0	−13	−28	88
[9]	−4	−4	−3	2	4	5	9	14	19	21	15	9	4	−2	35
	2	5	10	16	19	28	28	25	19	17	10	−1	−7	−14	49
	−2	2	4	12	18	22	24	22	19	16	11	3	−1	−8	42
	−2	0	4	11	13	19	21	21	19	18	13	4	−1	−7	39
[10]	−3	−1	0	2	5	10	12	17	21	18	11	6	1	−7	35
	−3	7	13	19	24	24	25	21	18	11	4	−3	−9	−14	46
	−2	2	8	12	13	17	21	21	20	14	6	1	−3	−9	38
	−1	2	7	10	14	17	20	19	20	14	6	2	−3	−10	36
[11]	−3	−2	−1	2	6	10	15	24	23	21	16	8	−1	−9	39
	3	11	16	24	26	28	26	23	18	8	−1	−5	−12	−14	55
	−2	3	9	12	17	23	24	25	20	13	8	0	−5	−10	45
	0	4	9	13	16	19	22	23	20	14	9	0	−7	−13	42
[12]	−2	−1	−1	0	0	−2	2	2	5	7	8	7	4	0	14
	−4	−2	2	5	6	8	11	14	16	14	9	5	4	1	27
	−8	−7	−4	−2	2	7	10	14	16	13	9	7	5	1	29
	−5	−3	−1	1	3	6	8	10	12	11	9	6	4	0	21
[13]	−3	−1	−1	0	1	3	3	4	8	8	7	6	3	1	13
	−1	0	3	5	7	10	9	8	8	7	4	2	0	0	19
	−2	−1	0	1	2	6	5	6	9	7	5	3	1	−1	14
	−2	0	0	2	3	6	5	6	8	7	5	4	2	0	13
[14]	0	1	1	−1	0	1	1	1	2	3	3	3	3	0	6
	1	2	3	5	4	4	5	6	5	3	2	1	−1	−2	12
	−2	−4	−2	−1	1	1	2	5	6	4	3	3	1	1	11
	−1	1	1	1	2	3	3	5	4	3	3	2	1	0	9
[15]	−2	0	1	1	0	0	−2	−1	1	3	4	3	3	2	11
	−4	−2	1	3	3	2	3	4	6	6	3	3	4	2	17
	−2	−4	−2	−1	0	0	0	3	5	4	5	5	4	3	9
	−2	−2	−1	0	1	2	0	2	5	4	3	4	4	2	13

TABLE 43

DISTURBED DAILY GEOMAGNETIC VARIATIONS OF VERTICAL COMPONENT Z (IN GAMMAS) YEAR OF LOW MAGNETIC ACTIVITY

Observatory and observation year	World time	1	2	3	4	5	6	7	8	9	10
Bukhta Tikhaya 1944 [1]	Winter	50	36	52	52	35	30	19	3	−22	−47
	Equinox	59	48	62	63	59	65	44	37	3	−57
	Summer	66	65	64	34	54	62	63	45	27	−13
	Year	55	47	55	55	53	55	45	31	5	−37
Mys Chelyuskin, 1944 [2]	Winter	159	86	104	70	80	65	7	−10	37	−39
	Equinox	104	126	141	121	73	106	50	48	13	−3
	Summer	55	58	62	91	90	78	74	69	8	15
	Year	107	91	102	94	81	82	40	35	−6	−9
Dikson, 1944 [3]	Winter	117	133	112	76	5	2	−15	−8	−5	−2
	Equinox	106	97	103	90	31	31	4	−12	−18	−4
	Summer	32	56	52	43	20	16	11	15	17	7
	Year	84	94	88	69	18	16	1	0	−1	3
Matochkin Shar, 1944 [4]	Winter	115	74	69	64	42	15	6	16	25	35
	Equinox	132	144	101	101	48	10	−21	−13	−17	3
	Summer	63	70	58	53	44	29	28	7	14	17
	Year	103	96	76	72	45	18	5	3	7	18
Tiksi, 1944 [5]	Winter	106	99	58	36	32	4	8	−35	−35	−19
	Equinox	111	180	168	97	156	72	46	−7	−9	4
	Summer	34	59	59	41	16	6	−38	36	−17	−10
	Year	81	110	91	52	63	35	15	−10	−12	−2
Uelen, 1943 [6]	Winter	−95	−73	−98	−89	−70	−50	−60	−43	−27	−6
	Equinox	−46	−67	−52	−22	−80	−54	−35	−29	−18	−9
	Summer	−59	−30	−37	−68	−94	−97	−51	−41	−24	−11
	Year	−73	−56	−63	−60	−82	−67	−50	−10	24	−10
Sverdlovsk, 1944 [7]	Winter	−8	−11	−11	−11	−7	−6	−6	−5	−4	−3
	Equinox	−6	−6	−7	−8	−13	11	−10	−9	−5	−3
	Summer	−3	−5	−6	−6	−6	6	−6	−8	−7	−5
	Year	−8	−8	−9	−10	−8	−8	−7	−7	−5	−4
[Lacking in original 1944] [8]	Winter	−11	−11	−10	−9	−8	−7	−7	−5	−4	−2
	Equinox	−6	−9	−11	−11	−11	−8	−8	−4	−4	−2
	Summer	−5	−4	−6	−6	−7	−6	−6	−5	−3	−2
	Year	−7	−8	−9	−9	−8	−7	−6	−4	−5	−3
Irkutsk, 1944 [9]	Winter	−5	−4	4	−4	−3	−3	1	−1	−2	−1
	Equinox	−3	−1	6	−6	−6	−6	−4	−6	−4	−3
	Summer	−1	−1	−1	−1	−2	−2	−4	−1	3	−3
	Year	−2	−3	−1	−3	−4	−4	−3	−4	−3	−2
Vladivostok, 1944 [10]	Winter	2	2	1	0	0	0	1	0	−3	−1
	Equinox	3	3	3	1	2	0	−2	−2	0	−1
	Summer	3	3	2	1	2	1	0	0	−1	−3
	Year										
Tbilisi, 1944 [11]	Winter	−2	−1	−4	−8	−1	−1	−2	−2	−4	−4
	Equinox	−2	−4	−4	−7	−3	−3	−3	−1	−1	−1
	Summer	1	0	0	−3	−1	−2	−2	−1	1	−2
	Year	−1	−3	−2	−6	−1	−2	−2	−1	−1	−2
Tashkent, 1944 [12]	Winter	2	1	0	0	−1	−5	0	−2	−2	−2
	Equinox	0	−1	−1	−3	−2	−8	−3	−3	−3	−3
	Summer	1	1	−1	0	0	−3	−1	−1	−2	−2
	Year	1	0	0	−1	−1	−4	−2	−2	−2	−3

	11	12	13	14	15	16	17	18	19	20	21	22	23		Amplitude
[1]	−98	−124	−138	−131	−97	−70	−13	23	48	104	98	83	72	41	242
	−112	−129	−142	−141	−130	−89	−55	−49	26	40	78	111	117	92	259
	−42	−89	−132	−140	−136	−104	−69	−30	7	61	67	45	49	49	206
	−83	−112	−136	−137	−124	−88	−46	77	25	67	78	78	77	59	215
[2]	−33	−39	−40	−47	−66	−92	−107	−118	−99	−36	6	39	41	121	277
	−33	−40	−33	−64	−83	−103	−92	−121	−110	−131	−65	−19	71	57	275
	11	9	−2	−25	−61	−103	−133	−138	−112	−87	−47	8	23	60	229
	−18	−24	−26	−46	−70	−100	−110	−126	107	−86	−35	9	45	79	233
[3]	9	8	18	8	−6	−28	−44	−116	−155	−153	−82	−20	53	83	288
	4	12	8	−7	−30	−58	−84	−99	−106	−109	−99	−24	−73	95	215
	12	16	22	19	6	−7	−42	−60	−74	−77	−61	−38	−3	24	133
	9	13	16	8	−10	−31	−57	−91	−112	−114	−81	−27	35	66	208
[4]	37	33	17	−1	−18	−100	−174	−160	−125	−103	−73	23	73	114	289
	15	1	−23	−35	−66	−79	−105	−112	−156	−93	−46	23	72	109	300
	27	28	27	9	−28	−51	−69	−93	−98	−102	−54	−10	16	21	172
	26	21	7	−9	−38	−76	−115	−122	−126	−99	−58	12	53	81	229
[5]	−20	−17	−6	−11	−7	−17	−16	−15	−56	−63	−78	−23	−14	78	184
	−12	−30	−25	−24	−25	−73	−144	−198	−169	−143	−63	−42	32	96	378
	−16	−13	25	8	17	−18	−82	−67	−59	−43	−39	6	17	31	141
	−10	−15	3	−4	−6	−33	−78	−102	−94	−83	−59	−21	11	66	212
[6]	11	27	43	48	52	56	65	69	76	74	68	40	14	−38	174
	13	28	37	42	49	59	62	75	64	57	39	−2	−29	−59	155
	16	30	48	43	43	65	67	56	55	57	50	41	1	−57	164
	12	27	41	42	50	62	66	68	67	64	53	27	−4	−51	150
[7]	−2	−1	1	2	5	6	11	15	21	22	5	−1	−3	−5	33
	−2	2	6	11	16	19	16	14	10	8	5	0	−1	−4	32
	−2	0	2	4	6	10	11	10	8	7	4	0	0	−1	19
	−2	0	3	6	8	12	13	13	13	11	5	2	−3	−5	23
[8]	−2	−3	−1	2	2	6	14	24	23	9	4	0	−3	−8	35
	1	4	7	11	14	15	13	11	10	7	3	−1	−4	−7	26
	−1	1	2	4	6	9	10	9	8	6	3	2	1	−1	17
	−1	1	2	5	8	10	12	14	14	8	4	1	−2	−6	23
[9]	−1	0	−1	−1	0	2	4	6	6	7	6	4	3	−4	12
	−4	−3	−1	−2	2	4	7	12	11	8	7	5	1	0	18
	−1	−3	−1	−1	−1	3	5	5	6	7	5	4	2	0	11
	−2	−1	−2	−1	0	2	6	7	8	7	6	4	2	−1	12
[10]	−2	−1	0	1	0	−2	−2	−2	1	1	3	2	3	3	6
	−3	−3	−4	−3	−3	−2	0	1	2	3	4	4	4	4	8
	−3	−3	−3	−3	−3	−3	−2	−1	2	3	3	3	3	4	7
[11]	−4	−5	−6	−4	−4	1	4	9	9	7	6	6	3	1	17
	0	1	2	3	5	5	5	4	3	2	0	0	−2	−1	12
	−2	−1	0	1	2	2	2	2	2	2	2	1	1	1	5
	−1	−1	−1	0	2	2	3	5	5	3	2	2	1	1	11
[12]	−1	−1	1	−1	−2	−2	−1	0	2	4	5	4	3	1	10
	−1	0	−1	0	1	2	3	3	3	3	3	2	2	1	11
	−3	−2	−2	−1	1	2	1	2	2	3	2	2	2	1	6
	−2	−2	−1	−1	0	1	2	2	2	3	4	2	3	0	8

TABLE 44

COEFFICIENT FOR THE TRANSFORMATION FROM ANNUAL TO SEASONAL VALUES OF THE DISTURBED DAILY

GEOMAGNETIC VARIATIONS

Local time	3	6	9	12	15	18	21	24	3	6	9	12	15	18	21	24	3	6	9	12	15	18	21	24
						D								H							Z			
												Winter												
80	1.5	1.4	0.4	0.3	1.6	0.5	1.2	0.4	0.7	-0.1	1.3	4.3	0.9	1.5	1.5	0.3	0.3	0.5	-0.7	0.8	0.7	-0.1	6.2	1.0
75	1.0	0.5	-1.1	1.6	0.8	0.6	0.6	1.6	0.7	0.7	0.9	0.8	0.9	0.8	1.8	0.9	0.7	0.4	0.4	9.0	0.2	1.0	1.2	1.0
70	0.0	0.2	-0.5	0.3	0.6	0.8	0.7	1.0	1.0	0.9	-0.2	1.0	0.7	1.0	1.3	1.2	0.6	0.1	2.9	1.1	1.1	0.4	1.3	1.2
65	-3.8	1.3	0.7	3.2	-7.0	1.8	-0.5	0.2	0.7	0.7	1.5	1.6	0.9	0.7	0.9	4.2	1.9	0.1	1.6	0.0	1.0	1.0	1.3	0.0
60	1.6	2.7	1.6	0.8	1.2	1.8	0.2	1.7	1.9	0.2	-7.4	8.4	1.8	0.4	0.6	-1.4	1.2	0.8	0.4	6.5	1.0	0.6	0.8	0.0
55	2.0	2.0	1.4	4.6	1.3	0.0	1.8	1.6	0.0	1.6	-1.2	-2.0	-1.0	-5.0	0.5	-1.6	0.8	0.6	0.8	-0.2	0.4	0.8	1.5	0.5
50	1.7	3.2	0.8	1.2	0.5	0.0	0.8	1.4	-1.6	0.6	5.0	8.0	-0.8	0.4	-6.0	-2.3	0.5	0.6	0.6	0.3	0.0	0.2	0.9	0.0
45	0.0	1.0	1.4	3.0	1.5	0.0	1.3	1.3	0.7	0.9	8.0	-0.8	1.5	1.8	4.2	0.9	0.8	0.6	0.8	0.0	0.3	0.7	1.4	0.0
40	1.8	1.4	1.2	4.4	0.5	2.0	1.6	1.8	0.6	0.8	2.6	-2.1	0.0	1.0	5.8	7.2	0.8	0.8	0.8	0.5	0.0	-0.2	1.2	0.5
												Equinox												
80	1.4	1.0	1.6	0.6	1.6	1.0	1.0	1.2	1.0	1.6	0.2	-0.3	1.2	1.0	4.5	1.6	1.2	0.7	0.4	0.9	1.0	1.1	-0.9	0.9
75	0.7	1.8	1.6	1.1	1.0	0.9	1.5	0.8	0.9	0.4	2.4	1.0	0.8	1.4	-0.4	1.0	1.2	1.4	1.0	-7.0	1.1	1.1	0.8	1.2
70	0.3	0.6	-0.5	0.7	1.2	1.0	1.8	0.9	1.2	1.2	0.7	1.5	1.3	1.2	1.1	1.3	1.8	2.1	0.8	2.0	4.2	1.9	1.1	1.4
65	2.8	1.0	0.4	0.2	0.7	2.5	-1.1	1.3	1.4	0.9	0.3	1.2	1.3	0.8	1.0	-1.8	2.9	1.6	0.4	0.0	0.7	0.6	0.7	0.0
60	1.2	0.0	1.2	1.2	1.0	2.1	2.3	1.4	0.8	0.6	-1.4	4.9	0.9	1.2	0.5	0.5	1.0	1.3	1.6	4.0	1.6	1.2	1.2	-2.2
55	-0.6	2.2	1.2	1.1	-1.4	0.0	0.8	1.2	2.3	1.0	2.4	1.0	2.6	3.0	-0.8	1.9	1.1	1.2	0.9	1.8	1.6	1.2	0.8	1.7
50	1.0	0.2	1.5	1.5	-1.5	2.8	1.6	1.3	3.0	2.0	0.0	0.0	1.6	1.9	1.0	1.7	2.2	1.1	1.0	0.7	2.0	1.4	1.0	0.0
45	2.3	0.7	1.9	2.8	0.7	7.0	1.3	1.0	1.8	1.1	1.0	1.8	1.4	1.0	-0.2	1.3	1.8	1.6	1.2	0.0	2.3	1.3	0.8	0.0
40	0.1	0.8	1.2	3.2	1.0	1.5	1.0	0.8	1.3	0.8	-0.4	2.2	-0.1	1.0	-2.0	-4.4	2.0	1.4	1.6	1.0	2.5	1.6	0.8	0.5
												Summer												
80	0.1	0.7	1.0	2.0	-0.1	1.5	0.8	1.5	1.3	1.5	1.4	-0.7	1.0	0.6	-3.7	1.0	1.4	1.8	3.4	1.3	1.3	2.0	-2.2	1.1
75	1.0	1.4	4.1	0.0	1.2	1.6	1.2	-0.2	1.2	1.7	2.5	1.0	1.2	1.2	-0.4	1.0	1.2	1.0	1.0	-0.5	1.7	1.0	0.8	1.0
70	1.8	1.2	1.6	-0.3	1.0	1.1	0.5	0.9	0.8	0.9	2.4	-0.1	0.9	0.8	0.6	0.5	0.6	0.2	1.4	0.9	-2.4	0.7	0.7	0.5
65	4.2	0.8	1.9	-0.3	1.1	-1.6	4.6	1.4	0.9	1.4	1.2	0.1	0.8	1.5	1.2	0.7	-1.3	1.3	0.9	0.0	1.1	1.3	0.8	0.0
60	0.2	0.6	0.2	0.6	0.2	1.0	0.5	-0.1	0.5	1.8	7.2	-4.8	0.2	1.4	1.4	1.6	0.7	0.8	1.3	-7.0	0.4	1.2	1.0	0.8
55	2.0	1.4	0.5	-2.4	3.1	0.0	0.6	0.2	1.2	-0.6	1.7	3.6	1.6	4.9	0.2	2.6	1.1	1.2	1.3	0.5	1.2	1.0	0.9	1.0
50	0.5	-1.5	0.7	0.4	2.5	0.0	0.9	0.3	1.8	0.4	-2.0	-6.0	1.8	0.1	6.0	3.0	0.7	1.0	1.7	2.3	0.7	1.4	1.0	0.0
45	2.0	-1.1	0.1	-2.8	1.3	-4.0	0.2	0.0	0.3	0.6	-7.0	2.4	1.1	0.5	-1.8	1.1	0.8	0.8	1.0	0.0	0.7	1.0	1.0	0.0
40	2.2	0.8	0.4	-4.6	3.0	-0.5	0.6	0.4	1.0	1.0	0.5	2.9	1.3	0.8	-1.7	-1.4	0.4	0.8	1.0	-1.0	0.2	1.2	1.4	0.8

TABLE 45

NUMBER OF STORMS USED IN DERIVATION OF STORM-TIME VARIATION

Observatory	D	H	Z	D	H	Z	D	H	Z	D	H	Z
	year			winter			equinox			summer		
Bukhta Tikhaya	—	49	52	—	9	10	—	12	18	—	23	34
Dikson	—	39	40	—	7	8	—	13	12	—	19	20
Uelen	—	38	39	—	6	7	—	12	12	—	20	20
Yakutsk	85	72	—	15	12	—	35	30	—	—	35	30
Kazan'	88	88	88	13	3	13	37	37	37	38	38	38
Sverdlovsk	91	90	91	15	5	15	38	37	38	38	38	38
Irkutsk	90	90	91	15	15	15	37	37	38	38	38	37
Tbilisi	91	91	91	15	15	15	38	38	38	38	38	38
Tashkent	91	87	90	15	15	15	38	34	37	38	38	38
Bladivostok	27	30	6	3	5	0	14	15	5	0	10	10
	moderate storms			intense storms			very intense storms					
Bukhta Tikhaya	—	23	23	—	14	15	—	12	14			
Dikson	—	17	17	—	12	12	—	10	11			
Uelen	—	16	16	—	13	13	—	9	10			
Yakutsk	34	34	—	20	20	—	18	13	—			
Kazan', Sverdlovsk, Irkutsk, Tbilisi, Tashkent	34	34	34	20	20	20	18	18	18			
Vladivostok	12	12	3	6	8	1	9	10	2			

TABLE 46

LIST OF STORMS WITH SUDDEN BEGINNING USED TO DERIVE STORM-TIME VARIATIONS

Serial No	Year Month	Day	Time hr	min	Characteristic	Observatories, whose data were not included in the processing
	1938					
1	I	16	22	36	VI	Di, yak, Vl
2		25	11	50	VI	Vl
3		31	10	30	I	Vl
4	II	6	3	09	M	Vl
5		13	20	36	I	Vl, BT
6	III	21	21	02	I	Vl, BT, Di, Ue
7	IV	13	11	42	I	Vl
8		16	5	46	VI	Vl, BT
9		22	11	58	M	Vl
10	V	11	15	52	VI	Vl, BT
11	VI	7	22	04	M	Vl
12		12	17	54	M	Vl
13	VII	15	3	14	VI	Vl
14		30	4	30	M	Vl
15	VIII	1	7	50	I	Vl
16		3	21	36	I	Vl, Di
17		10	3	20	I	Vl
18		22	13	54	M	Vl
19	IX	13	18	[illegible]	VI	Vl
20		26	7	24	I	Vl, BT, Di, Ue
21		27	22	04	I	Vl, BT, Di, Ue
22		30	10	22	VI	Vl, BT, Di, Ue
23	X	7	6	14	VI	Vl, BT, Di, Ue
	1939					
24	II	5	19	47	I	Vl, BT, Di, Ue, Ka
25	IV	17	1	54	I	Vl, BT, Di, Ue, Yak, Ka
26		24	17	36	VT	Vl, Yak
27	V	1	6	40	VI	Vl
28		5	20	44	I	Vl
29		27	20	50	M	Vl
30	VI	26	20	20	M	Vl
31	VII	3	0	30	I	Vl
32		4	14	10	M	Vl
33	VII	14	3	48	M	Vl
34		19	22	04	M	Vl, Di, Yak, Ue
35		21	9	56	I	Vl, Di, Yak, Ue
36	VIII	11	12	13	I	Vl, Di, Yak, Ue
37		21	21	24	VT	Vl

Serial No	Year Month	Day	hr	min	Characteristic	Observatories, whose data were not included in the processing
38	IX	2	21	40	M	Vl
39	X	13	2	04	VI	Vl
	1940					
40	I	3	14	39	I	Vl, BT, Di, Yak, Ka, Ue
41	II	24	22	10	M	Vl
42	III	23	6	18	VI	Vl, BT, Di, Yak, Ue
43		21	13	48	VI	Vl, BT, Di, Yak, Ue
44	IV	25	2	05	M	Vl
45	V	23	17	53	M	Vl, BT, Di, Yak, Ue
46	VI	25	02	52	VI	Vl, Di, Yak, Ue
47	VII	13	7	58	I	Vl
48	IX	26	17	04	M	Vl
	1941					
49	III	1	03	55	VI	BT, Di, Yak, Sv, Ue
50	VI	13	3	36	M	Vl
51	VIII	4	1	26	VI	
52	IX	13	7	42	M	BT, Di, Ue, Yak, Ir
53	X	31	3	37	I	
	1942					
54	II	28	9	02	VI	
55	III	5	4	19	I	Vl
56		26	5	39	M	
57	X	2	2	46	I	Vl
58	XII	29	17	33	M	Vl
	1944					
59	XII	15	18	51	VI	Yak, Vl, Ue
	1945					
60	IV	11	7	48	M	Di, Ue
61	XII	13	12	36	I	Di, Vl, Ue
	1946					
62	I	3	5	[illegible]	VI	Di, Ue

Serial No	Year Month	Day	hr	min	Characteristic	Observatories, whose data were not included in the processing
78	VI	5	7	24	VI	Di, Ue
79		13	17	46	M	Di, Ue
80	VII	17	17	47	M	Di, Ue
81	VIII	15	9	48	M	Di, Ue
82		22	9	11	M	Di, Vl, Ue
83	IX	2	23	25	M	Di, Ue
	1948					
84	II	3	2	07	I	Ir, Ue
85	III	11	21	40	VI	Di, Ue
86	IV	6	3	58	M	Di, BT, Ue
87	V	14	23	24	I	Di, BT, Ue
88	VIII	7	23	00	VI	Di, BT, Ue
89		19	19	[illegible]	M	Di, BT, Ue
90	IX	22	20	44	I	Di, BT, Ue
91	X	1	1	13	VI	Di, BT, Ue
92		17	22	11	M	Di, Vl, BT, Ue
63	IV	22	7	00	M	Di, BT, Ue
64	V	6	22	26	M	Di, BT, Ue
65	VI	5	20	11	VI	Di, BT, Ue
66	VII	18	9	03	VI	Di, BT, Ue, Yak
67	VIII	30	22	40	I	Di, BT, Ue
68	IX	16	13	46	I	Di, BT, Ue
69		17	23	55	M	Ue, BT, Di
70		21	17	16	I	Ue, BT, Di
	1947					
71	I	16	3	32	M	Ue, BT, Di
72	II	16	2	59	M	Ue, BT, Di
73	III	2	4	00	VI	Ue, BT, Di
74		15	8	40	M	Ue, BT, Di
75		27	4	20	M	Ue, BT, Di
76	IV	17	12	24	M	Ue, BT, Di
77	V	22	22	41	VI	Di, Ue, Ir, BT

TABLE 47

APERIODIC STORM-TIME VARIATIONS OF HORIZONTAL COMPONENT (H) (GAMMAS)

Observatory	0	0	0	0	1	2	3	4	5	6	7	8	9	10	11	12
							Year									
Bukhta Tikhaya [1]			−4	−12	−13	−2	−2	−7	−3	−5	−9	−3	3	5	−34	−51
Dikson [2]			14	−8	−34	−45	−51	−28	−29	−47	−25	−3	−3	−10	−18	−24
Uelen [3]			9	16	20	23	35	39	13	−10	−12	−12	−23	−43	−58	−56
Yakutsk [4]		0	0	1	6	1	0	−12	−11	−20	−27	−33	−33	−24	−23	−21
Kazan' [5]		1	0	0	11	13	4	−3	−9	−11	−13	−17	−22	−14	−21	−17
Sverdlovsk [5]		1	−1	0	12	16	5	−5	−14	−18	−17	−24	−29	−27	−29	−22
Irkutsk [7]		3	3	−7	16	19	7	−6	−21	−14	−18	−26	−31	−33	−34	−33
Tbilisi [8]		1	0	0	14	14	0	−7	−12	−15	−19	−22	−24	−27	−31	−34
Tashkent [9]		0	−1	0	7	12	2	−9	−15	−17	−20	−28	−29	−30	−36	−39
Vladivostok [10]		0	−1	2	8	8	4	−7	−10	−14	−19	−24	−31	−46	−47	−45
							Winter									
Bukhta Tikhaya [1]			4	1	−7	−2	−8	−20	−10	−2	−33	−49	−22	−14	−53	−73
Dikson [2]			35	3,	31	38	19	−7	−42	−78	−68	−36	−25	−42	−72	−46
Uelen [3]			−22	−14	−13	−24	−14	−7	−40	−53	−6	27	−16	−105	−106	−32
Yakutsk [4]		−2	1	0	6	1	−7	−7	−6	−2	−13	−26	−34	−29	−41	−36
Kazan' [5]		1	0	1	9	10	−1	−5	−7	−4	−11	−15	−14	−20	−25	−28
Sverdlovsk [6]		−1	−1	3	13	17	6	−1	−7	−8	−9	−22	−33	−30	−37	−27
Irkutsk [7]		−5	−1	7	12	11	1	−10	−10	−11	−14	−26	−41	−51	−52	−42
Tbilisi [8]		0	−2	2	14	11	−3	−11	−10	−15	−17	−29	−31	−34	−41	−39
Tashkent [9]		−2	−1	2	−2	−1	−6	−11	−16	−16	−16	−22	−24	−26	−36	−35
Vladivostok [10]		3	−2	−1	3	10	15	−5	−8	−3	−14	−20	−43	−54	−58	−51
							Equinox									
Bukhta Tikhaya [1]			−8	−33	−41	−27	−34	−36	−4	2	−7	−8	−17	−18	−28	−42
Dikson [2]			−7	−46	−96	−124	−117	−73	−48	−52	−52	−52	−46	−31	−27	−40
Uelen [3]			23	22	19	12	32	39	8	−3	5	3	9	−9	−58	−82
Yakutsk [4]		0	0	−1	1	−7	−12	−15	−23	−35	−43	−52	−43	−26	−24	−22
Kazan' [5]		0	0	1	12	11	3	−8	−19	−24	−25	−26	−35	−30	−31	−28
Sverdlovsk [6]		1	−1	0	12	14	0	−17	−32	−41	−35	−37	−43	−38	−41	−35
Irkutsk [7]		0	0	0	13	13	−1	−22	−27	−31	−35	−40	−40	−46	−44	−44
Tbilisi [8]		0	0	1	16	15	−6	−13	−22	−25	−29	−23	−32	−32	−34	−45
Tashkent [9]		0	−1	0	11	14	1	−19	−27	−28	−35	−38	−39	−41	−46	−55
Vladivostok [10]		−4	0	3	9	9	3	−8	−11	−19	−23	−24	−28	−57	−57	−54
							Summer									
Bukhta Tikhaya [1]			−9	−6	0	11	18	17	0	−9	2	20	28	10	−29	−47
Dikson [2]			20	3	−18	−27	−16	3	−14	−23	7	42	33	17	6	−4
Uelen [3]			12	21	31	44	51	53	32	−3	−22	−31	−41	−45	−42	−44
Yakutsk [4]		0	−1	2	10	8	−4	−11	−4	−13	−19	−19	−24	−20	−16	−15
Kazan' [5]		3	0	−2	10	16	8	2	0	−1	−2	−9	−11	−9	−10	−3
Sverdlovsk [6]		2	−1	−1	12	17	11	4	1	0	−4	−11	−13	−14	−14	−8
Irkutsk [7]		2	0	0	12	20	9	3	−1	−6	−11	−20	−25	−21	−24	−23
Tbilisi [8]		2	0	−1	12	15	8	1	−3	−5	−9	−18	−14	−18	−23	−22
Tashkent [9]		1	0	−1	6	14	7	0	−3	−6	−9	−21	−21	−22	−27	−26
Vladivostok [10]		4	−2	0	7	5	−1	−6	−9	−10	−15	−24	−28	−27	−27	−27

	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
Year																
[1]	−43	−36	−38	−42	−38	−33	−34	−44	−46	−46	−41	−38	−34	−35	−33	
[2]	−27	−43	−47	−33	−29	−42	−54	−54	−48	−62	−63	−36	−35	−47	−50	
[3]	−62	−68	−68	−82	−98	−98	−88	−80	−61	−43	−31	−31	−30	−36	−26	
[4]	−23	−21	−26	−30	−32	−35	−32	−29	−34	−38	−38	−38	−39	−40	−38	−37
[5]	−21	−26	−28	−27	−30	−32	−32	−32	−29	−31	−32	−33	−38	−37	−33	−33
[6]	−26	−28	−29	−27	−25	−33	−34	−34	−31	−30	−38	−39	−42	−40	−35	−37
[7]	−37	−40	−40	−40	−38	−44	−42	−45	−45	−48	−48	−44	−47	−42	−42	−41
[8]	−36	−38	−41	−40	−40	−42	−40	−42	−40	−44	−46	−43	−46	−41	−39	−40
[9]	−41	−41	−44	−44	−45	−50	−50	−50	−51	−53	−53	−52	−52	−51	−46	−45
[10]	−43	−40	−44	−40	−43	−46	−43	−49	−54	−60	−68	−64	−64	−61	−57	−51
Winter																
[1]	−74	−92	−96	−101	−111	−103	−127	−132	−87	−68	−78	−69	−49	−42	−44	
[2]	−5	−14	−47	−41	−3	−13	−75	−92	−53	−36	−23	26	52	50	18	
[3]	7	17	−26	−34	−70	−122	−122	−122	−110	−101	−104	−60	−39	−61	−74	
[4]	−33	−25	−32	−42	−50	−58	−56	−53	−51	−43	−42	−39	−39	−30	−31	−27
[5]	−31	−29	−28	−29	−27	−38	−39	−46	−49	−45	−45	−42	−50	−45	−41	−41
[6]	−41	−41	−27	−29	−36	−42	−44	−47	−53	−46	−50	−45	−49	−31	−25	−35
[7]	−49	−45	−50	−50	−53	−64	−63	−68	−63	−66	−56	−59	−66	−49	−48	−43
[8]	−43	−41	−43	−37	−41	−50	−45	−56	−63	−59	−59	−47	−55	−43	−42	−38
[9]	−31	−35	−46	−51	−47	−65	−64	−70	−76	−71	−64	−66	−67	−61	−56	−54
[10]	−44	−40	−50	−42	−50	−56	−68	−79	−81	−69	−103	−107	−115	−106	−96	−85
Equinox																
[1]	−46	−53	−46	−15	−1	−14	−26	−40	−88	−85	−52	−17	−18	−19	−12	
[2]	−49	−76	−78	−50	−66	−94	−91	−60	−65	−107	−115	−88	−88	−93	−68	
[3]	−72	−76	−89	−100	−110	−102	−88	−78	−68	−48	−48	−54	−54	−52	−34	
[4]	−22	−16	−22	−27	−33	−34	−29	−27	−33	−44	−40	−42	−44	−49	−46	−46
[5]	−29	−35	−35	−26	−32	−30	−30	−31	−27	−31	−30	−31	−45	−40	−36	−37
[6]	−32	−35	−34	−28	−30	−31	−32	−33	−28	−26	−40	−41	−51	−60	−43	−46
[7]	−51	−58	−52	−50	−46	−50	−46	−51	−53	−54	−60	−53	−55	−53	−53	−55
[8]	−50	−50	−50	−48	−46	−46	−40	−43	−37	−46	−49	−47	−54	−50	−46	−50
[9]	−54	−54	−55	−50	−52	−53	−52	−51	−53	−57	−58	−57	−60	−59	−53	−54
[10]	−56	−54	−58	−51	−47	−48	−42	−49	−61	−71	−72	−68	−67	−70	−65	−64
Summer																
[1]	−25	1	−6	−36	−28	−8	−4	−14	−18	−13	−25	−43	−44	−51	−48	
[2]	−19	−30	−26	−15	−12	−16	−19	−35	−35	−41	−43	−48	−32	−56	−64	
[3]	−73	−87	−71	−81	−93	−84	−77	−68	−41	−22	−13	−8	−19	−19	−7	
[4]	−22	−27	−28	−29	−25	−27	−26	−23	−28	−31	−36	−35	−35	−35	−35	−33
[5]	−10	−16	−22	−26	−28	−30	−31	−28	−24	−26	−30	−31	−27	−30	−28	−25
[6]	−14	−17	−24	−25	−26	−31	−32	−30	−26	−27	−31	−34	−31	−33	−31	−28
[7]	−27	−27	−32	−33	−33	−38	−38	−36	−36	−42	−39	−37	−38	−36	−35	−33
[8]	−20	−25	−30	−33	−33	−34	−37	−35	−34	−37	−37	−37	−34	−31	−32	−30
[9]	−32	−31	−33	−36	−38	−40	−42	−42	−40	−42	−43	−41	−40	−39	−36	−34
[10]	−23	−19	−21	−25	−33	−37	−32	−31	−30	−33	−41	−37	−35	−31	−25	−23

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ABLE 48

APERIODIC STORM-TIME VARIATIONS OF HORIZONTAL COMPONENT (H) (GAMMAS)

Observatory	0	0	0	0	1	2	3	4	5	6	7	8	9	10	11	12
Moderate storms																
Bukhta Takihaya [1]		−2	−6	−4	−14	−17	−9	1	4	2	5	16	21	10	5	
Dikson [2]		22	1	−38	−59	−44	−27	−26	−26	−15	−9	−15	−18	−3	12	
Uelen [3]		−7	1	6	14	35	62	61	30	13	19	28	36	49	46	
Yakutsk [4]	−3	−1	4	9	13	9	5	−1	−11	−18	−20	−19	−17	−17	−16	
Kazan' [5]	3	−2	−2	11	12	8	4	−2	−2	−4	−9	−12	−11	−12	−9	
Sverdlovsk [6]	2	−2	0	13	13	8	4	1	0	−4	−13	−18	−17	−16	−11	
Irkutsk [7]	−1	−1	2	13	12	4	−1	−1	−11	−16	23	−21	−23	−23	−20	
Tbilisi [8]	1	−1	−1	12	12	5	2	−7	−10	9	−18	−18	−16	−17	−14	
Tashkent [9]	0	−1	2	9	16	5	0	−5	−10	−9	−21	−20	−18	−19	−17	
Vladivostok [10]	1	−1	4	12	23	23	20	19	9	−2	−11	−21	−18	−19	−19	
Intense storms																
Bukhta Tikhaya [1]		−8	17	−7	34	48	28	3	−21	2	18	16	−7	−72	−90	
Dikson [2]		−12	−23	−10	43	84	73	27	−9	1	24	26	1	−48	−63	
Uelen [3]		30	28	38	53	51	14	−45	−71	−53	−46	−86	−139	−135	−129	
Yakutsk [4]	3	2	−6	1	−8	−22	−20	−14	−9	−25	−31	−32	−5	−10	−14	
Kazan' [5]	0	−1	0	8	7	−5	−7	7	−3	−6	−8	−11	−13	−23	−25	
Sverdlovsk [6]	1	−1	−1	11	9	0	−6	−8	−3	−7	−7	−11	−12	−21	−27	
Irkutsk [7]	3	−1	−1	13	13	1	−1	−9	−7	−8	−12	−15	−12	−22	−27	
Tbilisi [8]	−1	−3	4	6	5	0	−7	−7	−11	−13	−17	−15	−14	−24	−27	
Tashkent [9]	1	−1	0	5	−2	1	−5	−9	−5	−13	−15	−15	−15	−27	−3?	
Vladivostok [10]	−1	2	−2	6	−18	−31	−33	−36	−33	−25	−32	−40	−47	−56	−51?	
Very intense storms																
Bukhta Tikhaya [1]		6	−29	−43	−38	−49	−54	−21	−15	−44	−46	−36	−54	−96	−105	
Dikson [2]		34	−2	55	−131	−192	−133	−100	−36	−76	−25	−22	−10	−10	−37	
Uelen [3]		9	25	20	−6	13	35	14	16	10	−21	−27	−56	−131	−136	
Yakutsk [4]	−1	−1	3	14	10	−2	−30	−24	−49	−51	−65	−66	−65	−52	−37	
Kazan' [5]	−3	0	3	18	26	13	−2	−21	−22	−29	−30	−37	−41	−30	−27	
Sverdlovsk [6]	−4	0	5	20	33	16	0	−26	−28	−33	−18	−63	−66	−56	−31	
Irkutsk [7]	−2	1	2	18	22	10	−18	−33	−36	−47	−55	−67	−87	−70	−57	
Tbilisi [8]	2	−2	−1	18	18	−3	−18	−28	−31	−32	−43	−43	−64	−60	−58	
Tashkent [9]	1	0	−2	8	8	4	−18	−33	−33	−37	−16	−50	−59	−67	−62	
Vladivostok [10]	−1	0	0	4	11	9	−17	−23	−25	−34	−29	−36	−80	−75	−70	

	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
Moderate storms																
[1]	14	28	27	3	−6	1	−5	−11	−10	−18	−36	−52	−56	−55	−41	
[2]	8	10	18	10	−6	−22	−38	−32	−33	−48	−43	−31	−18	−17	−19	
[3]	24	19	0	−44	−90	−108	−101	−99	−85	−68	−63	−53	−53	−50	−31	
[4]	−16	−15	−13	−16	−20	−19	−15	−17	−18	−19	−22	−16	−15	−16	−19	−22
[5]	−11	−14	−15	−14	−16	−21	−20	−18	−15	−16	−20	−20	−18	−15	−13	−16
[6]	−13	−13	−16	−14	−16	−20	−18	−18	−15	−16	−22	−21	−21	−14	−14	−17
[7]	−21	−19	−21	−21	−19	−25	−25	−24	−25	−29	−30	−26	−25	−20	−20	−22
[8]	−16	−16	−18	−20	−21	−23	−22	−24	−23	−26	−26	−26	−28	−22	−22	−23
[9]	−19	−19	−21	−22	−23	−27	−27	−26	−28	−29	−27	−26	−28	−24	−27	−23
[10]	−12	−11	−9	−10	−14	−25	−27	−29	−30	−35	−38	−31	−24	−13	−7	−6
Intense storms																
[1]	−100	−100	−84	−48	−26	−18	−15	−26	−31	−26	−29	−35	−23	−5	0	
[2]	−48	−65	−100	−85	87	−102	−79	−40	−24	−38	−49	−37	−20	−10	−15	
[3]	−166	−186	−150	−124	−97	−49	−7	13	15	28	46	55	52	34	6	
[4]	−14	−35	−36	−36	−27	−30	−36	−35	−42	−39	−34	−35	−42	−47	−44	−31
[5]	−28	−25	−30	−28	−27	−28	−27	−28	−27	−35	−35	−34	−40	−45	−41	−35
[6]	−26	−19	−20	−29	−31	−28	−33	−33	−43	−48	−39	−43	−46	−53	−49	−43
[7]	−30	−26	−33	−29	−28	−35	−35	−37	−45	−51	−51	−48	−48	−53	−55	−48
[8]	−31	−28	−33	−26	−24	−31	−26	−35	−38	−37	−36	−33	−39	−44	−43	−41
[9]	−32	−34	−37	−33	−36	−40	−36	−42	−47	−48	−49	−47	−49	−54	−48	−48
[10]	−43	−33	−55	−47	−46	−51	−47	−50	−68	−82	−83	−80	−81	−92	−90	−78
Very intense storms																
[1]	−77	−73	−102	−122	−114	−100	−119	−135	−135	−125	−70	−20	−18	−46	−67	
[2]	−67	−103	−97	−39	−1	−16	−67	−104	−109	−121	−92	−48	−73	−127	−130	
[3]	−84	−73	−83	−88	−110	−151	−189	−176	−127	−110	−128	−127	−128	−113	−63	
[4]	−35	−26	−42	−53	−65	−83	−71	−51	−60	−80	−81	−94	−93	−80	−77	−77
[5]	−32	−27	−32	−40	−41	−40	−41	−51	−45	−48	−46	−54	−56	−58	−51	−53
[6]	−51	−53	−46	−37	−41	−44	−51	−58	−50	−37	−55	−58	−63	−68	−50	−56
[7]	−69	−67	−63	−72	−69	−73	−69	−84	−75	−77	−76	−77	−93	−86	−82	−75
[8]	−53	−57	−61	−62	−62	−63	−61	−60	−60	−69	−75	−68	−77	−70	−69	−70
[9]	−62	−63	−69	−73	−67	−78	−82	−80	−85	−88	−79	−86	−90	−88	−85	−81
[10]	−79	−80	−79	−74	−72	−65	−65	−74	−70	−72	−92	−91	−99	−96	−90	−88

TABLE 49

APERIODIC STORM-TIME GEOMAGNETIC VARIATIONS OF HORIZONTAL COMPONENT H (GAMMAS)

Year

Observatory	0	0	0	0	1	2	3	1	5	6	7	8	9	10
Sverdlovsk [1]	1	−1	0	12	16	5	−5	−14	−18	−17	−24	−29	−27	
Irkutsk [2]	3	3	−7	16	19	7	−6	−21	−14	−18	−26	−31	−33	
Tashkent [3]	0	−1	0	7	12	2	−9	−15	−17	−20	−28	−29	−36	

Observatory	24	25	26	27	28	29	30	31	32	33	34	35	36	[illegible]
Sverdlovsk [1]	−42	−40	−35	−37	−34	−34	−32	−31	−29	−29	−30	−33	−33	
Irkutsk [2]	−47	−42	−12	−41	−38	−38	−36	−36	−33	−30	−31	−34	−32	
Tashkent [3]	−52	−51	−46	−45	−44	−44	−42	−40	−37	−39	−40	−39	−38	

Winter

Observatory	0	0	0	0	1	2	3	4	5	6	7	8	9	[illegible]
Sverdlovsk [1]	−1	−1	3	13	17	6	−1	−7	−8	−9	−22	−33	−30	
Irkutsk [2]	−5	1	7	12	11	1	−10	−10	−11	−14	−26	−41	−51	
Tashkent [3]	−2	−1	2	−2	−1	−6	−11	−16	−16	−16	−22	−24	−26	

Observatory	24	25	26	27	28	29	30	31	32	33	34	35	36	[illegible]
Sverdlovsk [1]	−49	−31	−25	−35	−33	−33	−31	−27	−24	−22	−22	−22	−20	
Irkutsk [2]	−66	−49	−48	−43	−43	−42	−40	−41	−35	−27	−26	−31	−31	
Tashkent [3]	−67	−61	−56	−54	−47	−45	−45	−39	−39	−36	−34	−31	−32	

Equinox

Observatory													
Sverdlovsk [1]	1	−1	0	12	14	0	−17	−32	−41	−35	−37	−43	−38
Irkutsk [2]	0	0	0	13	13	−1	−22	−27	−31	−35	−40	−40	−46
Tashkent [3]	0	−1	0	11	14	1	−19	−27	−28	−35	−38	−39	−41

Observatory	24	25	26	27	28	29	30	31	32	33	34	35	36
Sverdlovsk [1]	−51	−50	−43	−46	−43	−41	−37	−38	−35	−36	−39	−43	−49
Irkutsk [2]	−55	−53	−53	−55	−53	−50	−44	−46	−43	−40	−44	−44	−44
Tashkent [3]	−60	−59	−53	−54	−53	−52	−47	−45	−40	−45	−50	−48	−51

Summer

Observatory	0	0	0	0	1	2	3	4	5	6	7	8	9
Sverdlovsk [1]	2	−1	−1	12	17	11	4	1	0	−4	−11	−13	−14
Irkutsk [2]	2	0	0	12	20	9	3	−1	−6	−11	−20	−25	−21
Tashkent [3]	1	0	−1	6	14	7	0	−3	−6	−9	−21	−21	−22

Observatory	24	25	26	27	28	29	30	31	32	33	34	35	36
Sverdlovsk [1]	−31	−33	−31	−28	−24	−28	−28	−26	−25	−25	−24	−27	−22
Irkutsk [2]	−38	−36	−35	−33	−27	−31	−33	−32	−30	−28	−27	−31	−28
Tashkent [3]	−40	−39	−36	−34	−34	−36	−35	−35	−33	−34	−33	−30	−28

Year

	11	12	13	14	15	16	17	18	19	20	21	22	23	24
[1]	−20	−22	−26	−28	−29	−27	−25	−33	−34	−34	−31	−30	−38	−9
[2]	34	−33	−37	−40	−40	−40	−38	−44	−42	−45	−45	−48	−46	−14
[3]	36	−39	−41	−41	41	−44	−45	−50	−50	−50	[illegible]	−31	−35	−32

	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52
[1]	−32	32	−38	26	−27	−27	−27	−26	−28	−28	−27	−30	−29	−27	26
[2]	−34	31	28	30	−33	−32	−32	33	−33	−34	−31	−33	−32	29	28
[3]	−41	31	39	−37	−39	−40	−38	−37	−38	−39	−36	−38	−37	34	34

Winter

	11	12	13	14	15	16	17	18	19	20	21	22	23	24
[1]	37	37	−41	−41	−37	−39	36	−42	−44	−47	−53	−46	50	[illegible]
[2]	52	42	−40	−45	40	−40	[illegible]	−54	−63	−68	−63	−56	−56	−29
[3]	−36	−35	[illegible]	−45	−46	[illegible]	−47	−55	−64	−70	−76	−71	−64	−36

	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52
[1]	−31	−22	−25	[illegible]	−21	[illegible]	[illegible]	−5	−14	−17	[illegible]	−15	−16	[illegible]	−12
[2]	−32	35	[illegible]	−34	−29	[illegible]	[illegible]	[illegible]	−24	−26	17	−21	−20	−14	20
[3]	−37	−41	40	40	5	−5	13	−26	−21	−26	−19	−22	−25	30	−24

Equinox

	11	12	13	14	15	16	17	18	19	20	21	22	23	24
[1]	41	−35	−32	−37	−34	−28	−30	−31	−32	−33	−28	−26	−40	−41
[2]	−44	−44	−51	−58	−52	−50	−46	−50	−46	−51	−53	−54	−50	−53
[3]	−46	−55	−54	−54	−55	−50	−52	−55	−52	−51	−53	−57	[illegible]	−57

	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52
[1]	44	−45	−37	−35	−43	−40	−43	−42	−48	−46	−44	−41	−43	−39	−38
[2]	−48	−43	−39	−46	−53	−51	−51	−57	−56	−36	−51	−53	−53	−46	−45
[3]	−54	[illegible]	−49	−48	[illegible]	[illegible]	[illegible]	[illegible]	−61	−52	−58	−60	−56	[illegible]	−59

Summer

	11	12	13	14	15	16	17	18	19	20	21	22	23	24
[1]	14	−8	−11	−17	−24	−25	−26	−31	−32	−30	−28	−27	[illegible]	−31
[2]	−24	−23	−27	[illegible]	−32	−33	−33	−38	−38	−36	−36	[illegible]	−33	−37
[3]	27	−26	−32	−31	[illegible]	−36	−38	−40	−42	−42	−40	−42	[illegible]	[illegible]

	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52
[1]	[illegible]	22	−20	−19	[illegible]	−17	−15	−14	−14	−15	−18	−21	−20	−22	−19
[2]	27	−25	−23	21	−22	−24	−22	−21	−22	−23	−23	−26	−23	−25	−21
[3]	30	−28	−30	[illegible]	−29	−25	−25	−25	−25	−23	−21	−25	−23	−25	−25

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TA LE 50

APERIODIC STORM TIME GEOMAGNETIC VARIATIONS OF HORIZONTAL COMPOENT H

(GAMMAS)

Observatory	0	0	0	0	1	2	3	4	5	6	7	8	9	10
Moderate storms														
Sverdlovsk [1]	2	−2	0	13	13	8	4	1	0	−4	−13	−18	−1[illegible]	
Irkutsk [2]	−1	−1	2	13	12	4	−1	−4	−11	−16	−23	−24	−23	
Tashkent [3]	0	−1	2	9	16	5	0	−5	−10	−9	−21	−20	−18	

Observatory	24	25	26	27	28	29	30	31	32	33	34	35	36
Sverdlovsk [1]	−21	−14	−14	−17	−15	−16	−15	−15	−14	−14	−16	−14	[illegible]
Irkutsk [2]	−25	−20	−20	−22	−21	−19	−17	−22	−20	−19	−19	−25	−2[illegible]
Tashkent [3]	−28	−24	−23	−23	−20	−20	−18	−18	−17	−18	−21	−17	−1[illegible]

Observatory	0	0	0	0	1	2	3	4	5	6	7	8	9	10
Intense storms														
Sverdlovsk [1]	1	−1	−1	11	9	0	−6	−8	−3	−7	−7	−11	−1[illegible]	
Irkutsk [2]	3	−1	−1	13	13	1	−4	−9	−7	−8	−12	−15	−12	
Tashkent [3]	1	−1	0	5	−2	1	−5	−9	−5	−13	−15	−15	−1[illegible]	

Observatory	24	25	26	27	28	29	30	31	32	33	34	35	36
Sverdlovsk [1]	−46	−53	−49	−43	−38	−38	−33	−28	−30	−27	−25	−25	−2[illegible]
Irkutsk [2]	−48	−53	−55	−48	−42	−41	−36	−33	−30	−26	−27	−24	−27
Tashkent [3]	−49	−54	−48	−48	−45	−45	−43	−41	−35	−36	−35	−31	−3[illegible]

Observatory	0	0	0	0	1	2	3	4	5	6	7	8	9	10
Very intense storms														
Sverdlovsk [1]	−4	0	5	20	33	16	0	−26	−28	−33	−18	−63	−66	
Irkutsk [2]	−2	1	2	18	22	10	−18	−33	−36	−47	−55	−67	−87	
Tashkent [3]	1	0	−2	8	8	4	−18	−33	−33	−37	−46	−50	−59	

Observatory	24	25	26	27	28	29	30	31	32	33	34	35	36
Sverdlovsk [1]	−63	−68	−50	−56	−47	−46	−48	−48	−41	−46	−48	−60	−6[illegible]
Irkutsk [2]	−93	−86	−82	−75	−57	−61	−63	−61	−55	−52	−54	−59	−52
Tashkent [3]	−90	−88	−85	−81	−73	−74	−71	−66	−64	−68	−68	−70	−6[illegible]

Observatory	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Moderate storms														
Sverdlovsk [1]	−16	−14	−13	−13	−16	−14	−16	−20	−18	−18	−15	−16	−22	−21
Irkutsk [2]	−23	−20	−21	−19	−21	−21	−19	−25	−25	−24	−25	−29	−30	−26
Tashkent [3]	−19	−17	−19	−19	−21	−22	−23	−27	−27	−26	−28	−29	−27	−26

Observatory	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52
Sverdlovsk [1]	−18	−17	−10	−15	−12	−16	−14	−12	−12	−18	−16	−16	−16	−13	−15
Irkutsk [2]	−26	−23	−17	−20	−23	−22	−23	−24	−25	−28	−26	−28	−22	−19	−19
Tashkent [3]	−22	−23	−22	−26	−29	−29	−26	−24	−24	−26	−24	−26	−23	−19	−21

Observatory	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Intense storms														
Sverdlovsk [1]	−21	−27	−26	−19	−20	−29	−31	−28	−33	−33	−43	−48	−39	−43
Irkutsk [2]	22	−27	−30	−26	−33	−29	−28	−35	−35	−37	−45	−51	−51	−48
Tashkent [3]	−27	−33	−32	−34	−37	−33	−36	−40	−36	−42	−47	−48	−49	−47

Observatory	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52
Sverdlovsk [1]	−27	−26	−23	−17	−21	−19	−22	−19	−21	−18	−20	−23	−26	−23	−22
Irkutsk [2]	−27	−24	−24	−20	−24	−22	−26	−24	−25	−27	−23	−22	−24	−22	−22
Tashkent [3]	−30	−32	−31	−27	−27	−28	−29	−28	−29	−27	−23	−23	−26	−21	−20

Observatory	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Very intense storms														
Sverdlovsk [1]	−53	−31	−51	−55	−46	−37	−41	−44	−51	−58	−50	−37	−55	−58
Irkutsk [2]	−70	−57	−69	−67	−63	−72	−69	−73	−69	−84	−75	−77	−76	−77
Tashkent [3]	−67	−62	−62	−63	−69	−73	−67	−78	−82	−80	−85	−88	−79	−86

Observatory	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52
Sverdlovsk [1]	−51	−53	−50	−44	−46	−44	−43	−47	−51	−45	−43	−43	−44	−42	−46
Irkutsk [2]	−53	−52	−51	−57	−59	−59	−55	−58	−54	−51	−47	−54	−56	−54	−49
Tashkent [3]	−76	−73	−68	−61	−64	−65	−62	−62	−64	−66	−63	−68	−66	−70	−66

TABLE 51

APERIODIC STORM-TIME VARIATIONS OF VERTICAL COMPONENT (Z) (GAMMAS)

Observatory	0	0	0	0	1	2	3	4	5	6	7	8	9	10	11
Year															
Bukhta Tikhaya [1]		−11	14	48	35	4	12	25	18	0	−24	−12	2	4	8
Dikson [2]		−19	−12	−2	25	36	21	17	22	19	19	28	22	11	10
Uelen [3]		−7	−11	−20	−28	−26	−14	2	7	7	16	25	25	26	32
Kazan' [4]	0	0	−1	−4	−8	−9	−7	−6	−6	−4	−4	−6	−2	−1	4
Sverdlovsk [5]	0	0	0	−3	−8	−4	−6	−3	4	−4	−1	−4	−2	0	8
Irkutsk [6]	0	−1	−1	−1	−4	−2	−2	−3	−2	−1	0	−1	1	2	4
Tbilisi [7]	0	0	0	−2	−2	−1	−1	0	1	2	3	3	4	4	5
Tashkent [8]	0	0	0	2	0	−1	0	2	3	4	5	5	5	5	6
Vladivostok [9]	1	−1	0	0	−3	−3	−7	−6	−4	−2	2	4	5	8	1
Winter															
Bukhta Tikhaya [1]		−5	30	61	12	−41	−27	−46	33	38	53	61	73	91	79
Dikson [2]		−22	−22	−23	−13	−15	−39	−49	−38	−27	−18	4	24	55	61
Uelen [3]		−4	−6	6	9	15	29	35	35	33	33	30	22	7	6
Kazan' [4]	0	0	−1	−2	−7	−6	−3	−1	2	5	1	−3	7	−3	−9
Sverdlovsk [5]	−2	0	1	0	−1	3	5	8	10	9	−1	3	5	−7	−8
Irkutsk [6]	1	1	−3	−4	−4	−1	1	5	4	3	−1	−2	−2	−1	−5
Tbilisi [7]	0	0	−1	−3	−2	1	1	2	3	4	6	7	8	9	8
Tashkent [8]	0	0	1	1	1	0	0	3	4	5	3	2	4	1	5
Vladivostok [9]															
Equinox															
Bukhta Tikhaya [1]		0	9	43	60	47	40	38	26	11	−5	−16	−14	−4	2
Dikson [2]		−8	−15	−8	34	57	44	52	56	39	34	37	20	4	6
Uelen [3]		−6	−23	−53	−59	−45	−29	−9	−4	−14	−6	11	13	8	20
Kazan' [4]	0	0	−1	−7	−13	−10	−13	−12	−13	−9	−8	−12	−6	−6	2
Sverdlovsk [5]	0	0	−2	−8	−15	−12	−14	−11	−12	−9	−6	−11	−9	−4	11
Irkutsk [6]	1	0	−2	−4	−8	−5	−5	−8	−6	−2	1	1	1	3	11
Tbilisi [7]	0	0	0	−2	−3	−3	−2	1	2	2	2	3	2	3	6
Tashkent [8]	−1	0	0	2	−4	−5	−3	1	2	4	6	5	5	5	6
Vladivostok [9]	1	−1	−1	0	−4	−3	−5	−5	−4	−2	3	4	6	8	1
Summer															
Bukhta Tikhaya [1]		−21	11	47	46	30	27	20	7	−19	−38	−38	−40	−47	−51
Dikson [2]		−24	−6	10	31	41	30	21	25	25	23	15	22	−2	−9
Uelen [3]		−7	−5	−10	−23	−29	−20	−3	6	12	23	30	34	43	50
Kazan' [4]	−1	1	−1	−1	−3	−2	−3	−3	−2	−3	0	−2	0	6	10
Sverdlovsk [5]	−1	0	0	1	−3	0	−2	0	−3	−3	0	−2	1	7	11
Irkutsk [6]	0	0	1	3	2	2	1	1	1	0	0	1	2	4	6
Tbilisi [7]	0	0	0	0	0	0	0	0	1	1	3	3	3	3	1
Tashkent [8]	0	0	0	2	2	2	1	2	4	4	4	5	4	5	6
Vladivostok [9]	−3	−2	−5	1	−2	−6	−12	−9	−6	0	−1	1	3	6	2

Year

	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
[1]	−8	−20	−9	3	10	14	14	13	15	22	25	30	36	32	27	
[2]	14	13	3	5	16	26	30	30	22	17	13	13	19	31	38	
[3]	31	27	19	−4	−17	−9	0	3	8	3	−6	−9	−9	11	−7	
[4]	4	5	6	7	9	8	9	10	9	10	11	8	6	6	6	6
[5]	8	8	8	8	9	12	11	12	10	11	8	7	7	6	5	6
[6]	2	4	4	6	6	7	9	9	8	11	9	7	6	7	6	8
[7]	6	5	6	6	7	7	8	8	9	9	8	8	7	6	6	6
[8]	7	8	7	9	10	10	11	11	11	11	11	11	10	10	10	11
[9]	2	2	2	7	8	6	4	5	3	4	4	7	11	12	13	13

Winter

	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
[1]	30	11	51	88	95	69	49	61	58	46	39	35	22	3	−7	
[2]	21	−30	−58	−55	−58	−71	−64	−38	6	48	41	16	−2	6	−11	
[3]	−4	7	29	39	39	34	12	−9	−3	−3	−14	15	0	8	5	
[4]	−7	−1	7	10	7	13	13	15	25	25	13	12	17	19	16	14
[5]	−9	−3	7	7	6	11	11	15	23	24	9	10	16	17	14	15
[6]	−6	1	4	4	3	5	6	7	9	13	11	7	9	11	11	11
[7]	7	6	9	10	12	13	13	15	15	14	13	12	12	11	11	12
[8]	5	6	8	9	10	10	12	11	11	14	14	13	13	13	14	14
[9]																

Equinox

	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
[1]	11	24	42	55	66	76	75	57	49	46	51	59	57	57	61	
[2]	12	16	17	21	44	74	82	83	67	27	9	14	28	39	49	
[3]	20	6	−16	69	−59	−33	−8	2	−1	−12	−19	−18	−12	−11	−3	
[4]	0	2	5	6	11	9	11	10	5	6	9	8	6	5	5	6
[5]	9	10	12	10	10	13	10	12	4	5	6	7	7	6	6	6
[6]	3	7	6	9	8	10	11	10	8	9	10	7	7	8	8	11
[7]	8	6	6	6	7	7	8	8	9	9	9	9	8	.6	6	9
[8]	8	9	9	11	11	11	12	11	12	11	11	11	8	9	9	10
[9]	2	2	3	7	10	7	3	4	4	4	4	9	12	14	13	12

Summer

	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
[1]	−56	−66	−69	−69	−62	−51	−42	−36	−25	−5	1	5	24	26	17	
[2]	10	26	19	17	28	31	33	20	−1	−3	4	9	20	41	63	
[3]	48	46	38	12	−12	−9	0	8	16	13	5	−2	−12	−19	−15	
[4]	12	10	6	7	7	5	6	7	8	9	13	7	3	2	3	4
[5]	12	9	5	6	9	10	10	9	10	13	7	5	4	3	−1	3
[6]	4	3	3	4	5	5	8	9	9	10	9	7	5	4	4	5
[7]	5	5	5	5	5	5	6	6	7	7	7	5	5	5	5	5
[8]	6	6	5	6	7	9	9	10	10	10	10	10	9	9	9	9
[9]	4	6	2	5	0	4	6	7	0	3	4	−1	4	4	12	12

TABLE 52

APERIODIC STORM-TIME VARIATIONS OF VERTICAL COMPONENT (Z) (GAMMAS)

Observatory	0	0	0	0	1	2	3	4	5	6	7	8	9	10	11	12
Moderate storms																
Bukhta Tikhaya [1]			–14	5	35	46	36	36	54	57	28	11	13	12	3	–5
Dikson [2]			–25	–20	–2	9	15	15	8	3	3	19	46	44	30	32
Uelen [3]			–3	–10	26	–44	–52	–41	30	–11	–5	2	15	26	31	28
Kazan' [4]		0	1	0	–1	–4	–3	–1	2	1	2	2	1	1	0	1
Sverdlovsk [5]		–1	0	1	0	–3	–1	2	5	5	4	4	3	3	3	4
Irkutsk [6]		0	–1	1	1	–1	1	1	1	1	0	2	3	2	4	4
Tbilisi [7]		0	0	–1	–1	–1	0	0	1	2	3	5	4	2	1	1
Tashkent [8]		1	0	0	3	1	0	0	1	2	3	3	4	4	3	3
Vladivostok [9]		3	–2	–2	–1	–3	–2	–5	4	0	–2	0	2	5	8	7
Intense storms																
Bukhta Tikhaya [1]			–1	8	43	30	53	–5	–26	–61	–77	–80	–73	–63	–47	–32
Dikson [2]			2	31	34	32	17	–22	–47	–44	–32	–13	14	25	1	–25
Uelen [3]			–16	–13	–6	–2	1	9	11	8	16	30	23	1	–11	–5
Kazan' [4]		0	1	–2	–5	–8	–22	–11	–12	–6	–1	3	–2	–6	–7	–6
Sverdlovsk [5]		2	1	–2	–3	–9	–8	–9	–7	–5	–2	2	–1	–8	–9	–3
Irkutsk [6]		1	–1	–1	–1	–2	–3	–3	–2	–1	–3	–3	–2	0	1	1
Tbilisi [7]		–1	0	0	–1	–2	–5	–4	–3	–2	–1	0	0	0	–1	0
Tashkent [8]		–1	2	–1	4	1	0	2	3	5	5	5	3	1	–1	1
Vladivostok [9]		1	–2	0	3	–1	–3	–1	–1	–1	–3	–3	–5	–5	–6	–7
Very intense storms																
Bukhta Tikhaya [1]			–14	29	77	60	27	25	35	41	32	23	14	15	18	18
Dikson [2]			–32	–53	–46	35	84	72	91	116	93	46	14	–10	–2	35
Uelen [3]			–3	–10	–30	–36	–21	–2	33	40	31	25	47	59	89	85
Kazan' [4]		–3	0	4	5	5	12	2	1	–1	–5	–13	–21	–4	–7	6
Sverdlovsk [5]		–5	0	4	5	3	11	–1	0	–6	–11	–21	–24	–9	–8	2
Irkutsk [6]		–1	3	–1	1	–2	3	–2	–1	–2	–3	–4	–6	–4	–1	4
Tbilisi [7]		0	0	0	–1	0	3	5	6	8	8	9	10	12	12	12
Tashkent [8]		–2	–1	2	4	1	–1	1	5	8	9	11	10	13	15	15
Vladivostok [9]		–2	0	2	–2	–6	–6	–13	–14	–11	–2	6	8	10	12	–6

Moderate storms

	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
[1]	−9	−14	−21	−30	−17	−11	−1	1	1	12	22	22	18	12	19	
[2]	4	27	30	43	55	50	42	24	−2	−15	−29	−32	−24	−18	5	
[3]	22	23	17	−11	−30	−26	−25	−27	−17	−11	−15	−13	−11	−8	1	
[4]	2	3	3	5	3	1	2	3	3	3	9	6	6	8	10	8
[5]	5	6	6	9	5	5	6	9	5	5	3	7	7	9	5	8
[6]	4	3	4	4	4	5	5	6	5	6	4	5	5	5	4	5
[7]	1	1	1	2	3	5	6	5	6	5	5	4	5	5	5	4
[8]	3	4	4	5	6	6	6	6	6	6	6	6	6	6	6	6
[9]	7	9	9	10	10	5	0	7	3	4	2	2	5	5	3	0

Intense storms

	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
[1]	−31	24	−5	19	31	47	49	29	12	14	16	27	50	49	23	
[2]	−11	5	−6	−17	−2	28	39	37	32	29	37	41	36	42	37	
[3]	−7	−19	−22	−39	−45	−30	−16	−7	−7	−17	−22	−20	−17	−22	−27	
[4]	−2	2	2	−2	−3	−1	−3	2	−1	−1	−2	−3	−3	−1	−2	−1
[5]	−6	0	−2	−8	−1	2	−4	2	−1	1	0	−1	0	3	−1	1
[6]	2	2	4	2	3	5	5	5	5	7	9	8	6	6	5	8
[7]	0	1	3	3	4	3	3	5	6	5	5	5	6	6	6	6
[8]	3	5	5	6	6	6	7	5	6	6	8	7	7	9	10	11
[9]	−6	−5	−4	−1	−6	−7	−9	−14	−20	−21	−18	−4	0	3	7	10

Very intense storms

	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
[1]	−14	−22	12	41	35	10	2	19	42	48	41	42	48	49	48	
[2]	42	10	−21	−26	−17	−10	−16	34	56	60	52	76	65	89	85	
[3]	92	87	77	51	36	45	55	60	62	46	27	13	2	−5	0	
[4]	11	12	15	26	24	29	29	20	21	21	23	17	19	16	14	16
[5]	5	5	15	25	24	29	27	16	13	15	5	4	14	11	9	13
[6]	1	5	7	10	10	12	14	11	8	11	10	4	7	10	11	14
[7]	15	14	15	15	16	17	18	17	17	20	19	17	17	15	14	13
[8]	14	14	12	14	17	18	21	22	21	21	23	21	18	18	19	20
[9]	−4	−5	−5	5	12	14	14	11	12	16	16	18	24	26	29	28

TABLE 53

APERIODIC STORM-TIME VARIATIONS OF DECLINATION D (IN MINUTES)

Observatory		0	0	0	0	1	2	3	4	5	6	7	8	9	10	11	12
							Year										
Yakutsk	[1]	0.3	−0.2	0.0	−0.5	−0.7	1.3	0.5	−0.5	0.5	−1.1	−2.1	−2.3	−2.3	−2.6	−2.4	
Kazan'	[2]	−0.1	0.0	0.2	−0.7	0.2	0.3	0.8	0.7	1.1	1.7	2.6	2.9	3.0	3.3	3.3	
Sverdlovsk	[3]	−0.7	0.1	0.0	−1.0	−1.2	−0.6	0.3	0.5	1.3	2.4	3.5	4.0	3.3	3.5	3.3	
Irkutsk	[4]	0.0	0.0	0.1	−0.1	0.1	0.4	0.0	0.0	0.1	−0.2	−0.1	−0.2	−0.3	−0.2	−0.1	
Tbilisi	[5]	−0.2	0.1	0.0	−0.2	−0.3	0.4	0.7	0.7	1.0	1.4	2.0	2.0	2.0	2.2	2.1	
Tashkent	[6]	−0.1	0.1	0.0	−0.6	−0.3	0.2	0.3	0.5	0.7	1.2	1.6	1.4	1.3	1.5	1.9	
Vladivostok	[7]	0.2	−0.2	−0.4	0.1	0.3	−0.3	−1.0	−1.7	−1.7	−2.0	−2.2	−1.8	−2.0	−2.5	−2.1	
							Winter										
Yakutsk	[1]	0.8	−1.1	0.4	1.1	2.0	4.4	4.3	5.3	4.4	3.7	2.5	0.3	1.9	−0.5	−1.0	
Kazan'	[2]	0.2	−0.4	0.1	−0.5	−1.6	0.1	1.3	1.9	3.3	3.7	5.6	5.1	6.5	10.4	9.3	
Sverdlovsk	[3]	−0.8	−0.4	1.0	0.0	0.5	1.8	1.0	1.7	3.5	5.9	8.5	7.3	6.8	8.6	8.3	
Irkutsk	[4]	−0.7	−0.1	0.7	0.6	0.8	2.4	1.5	2.4	2.4	1.9	3.6	1.9	2.4	2.8	1.5	
Tbilisi	[5]	0.0	0.0	0.0	−0.6	−1.7	0.1	0.3	0.8	1.0	1.8	3.1	2.8	3.4	4.6	4.9	
Tashkent	[6]	−0.1	−0.1	0.2	−0.4	0.8	1.1	0.7	1.0	1.5	2.0	3.3	2.8	3.6	4.2	3.9	
Vladivostok	[7]	−0.2	−0.1	−0.2	0.2	−0.4	−1.2	−0.2	−0.7	−1.6	−1.7	−1.9	−2.4	−3.9	−3.5	−3.6	
							Equinox										
Yakutsk	[1]	−0.1	−0.1	0.2	−2.8	−3.4	0.7	−0.3	−3.7	−2.7	−4.3	−5.0	−5.0	−4.5	−4.0	−2.2	
Kazan'	[2]	−0.7	0.2	0.3	−1.4	0.6	0.5	0.6	0.7	0.2	0.8	1.3	1.6	1.9	1.0	1.4	
Sverdlovsk	[3]	−0.9	0.3	0.1	−0.6	−1.2	−0.8	0.9	1.2	1.5	2.7	3.3	3.9	3.2	2.2	2.8	
Irkutsk	[4]	−0.1	0.0	0.0	−0.8	0.0	0.2	−0.9	−1.1	−1.1	−1.4	−1.9	−1.5	−2.0	−1.9	−0.4	
Tbilisi	[5]	−0.4	0.2	0.2	0.2	0.5	1.0	1.2	1.2	1.5	1.6	2.3	2.0	2.0	1.7	1.9	
Tashkent	[6]	−0.3	0.2	0.0	−0.8	−0.4	0.1	0.4	0.7	0.8	1.4	1.2	1.2	1.0	0.7	1.5	
Vladivostok	[7]	−0.1	−0.2	0.0	−0.1	0.4	0.4	−0.7	−1.5	−1.4	−1.6	−1.7	−1.5	−1.8	−3.2	−2.3	
							Summer										
Yakutsk	[1]																
Kazan'	[2]	0.1	−0.2	0.2	−0.1	0.2	0.1	0.6	0.1	1.1	1.9	2.7	3.3	2.5	2.9	2.1	
Sverdlovsk	[3]	−0.1	0.5	−0.3	−1.6	−1.6	−1.1	−0.3	−0.4	0.5	1.0	2.0	0.9	2.4	3.0	2.1	
Irkutsk	[4]	0.1	0.0	−0.2	0.0	−0.1	−0.3	0.0	0.0	0.2	0.0	0.0	0.1	0.2	0.2	0.2	
Tbilisi	[5]	−0.1	0.1	−0.1	−0.2	−1.4	0.2	0.5	0.3	0.7	1.1	1.5	1.7	1.7	1.8	1.3	
Tashkent	[6]	−0.1	0.0	0.0	−0.5	−0.5	−0.1	0.3	0.2	0.4	0.7	1.3	1.2	0.7	1.1	1.5	
Vladivostok	[7]	0.5	−0.1	−1.0	0.4	0.6	−0.9	−1.7	−2.4	−2.1	−2.5	−2.9	−2.2	−1.7	−1.0	−1.3	

Year

	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
[1]	−2.8	−2.9	−2.6	−2.9	−2.0	−1.8	−2.8	−2.5	−3.2	−3.3	−3.4	−4.1	−2.8	−3.3	−3.8	−3.7
[2]	2.6	3.2	3.0	3.2	3.6	3.5	4.1	4.3	4.3	3.9	4.0	3.9	3.8	3.8	3.8	3.5
[3]	2.7	3.5	3.0	2.9	3.5	3.3	3.6	4.4	5.2	4.4	4.6	4.3	4.0	4.2	3.3	3.0
[4]	−0.1	−0.2	0.0	−0.1	0.0	0.3	0.3	0.7	0.4	0.2	−0.2	−0.3	0.0	−0.1	−0.1	0.0
[5]	1.8	1.9	1.8	1.9	1.9	1.8	1.8	2.0	2.0	2.4	2.5	2.4	2.3	2.4	2.1	1.8
[6]	1.8	1.8	1.5	1.3	1.4	1.6	1.6	2.0	2.2	2.1	2.0	1.8	1.7	1.6	1.4	1.2
[7]	−2.7	−3.3	−2.1	−2.1	−2.3	−1.7	−1.6	−1.8	−2.2	−3.1	−3.8	−3.7	−3.0	−2.5	−2.5	−2.2

Winter

	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
[1]	−1.4	−1.1	−2.1	−4.7	−3.0	−1.8	−2.2	−0.7	−1.8	−2.3	−0.9	−1.2	−1.2	−2.6	−2.4	−0.5
[2]	7.7	7.0	6.2	5.8	5.9	6.9	6.7	6.7	7.0	5.5	4.6	4.4	4.8	5.2	4.0	4.5
[3]	6.3	10.5	5.6	5.6	6.6	6.5	7.0	8.4	9.1	7.4	7.0	6.9	6.9	6.6	3.6	4.0
[4]	1.4	1.4	0.6	−0.4	−0.5	0.4	1.8	3.6	1.4	0.6	0.2	0.6	1.7	0.8	0.5	1.1
[5]	3.8	3.4	3.8	3.7	3.9	4.0	3.9	3.6	3.1	3.4	3.1	3.2	2.7	2.8	2.2	1.8
[6]	3.5	2.8	2.9	3.0	3.1	3.2	3.2	4.1	4.0	3.1	2.6	2.7	2.8	2.3	1.7	2.2
[7]	−3.6	−3.8	−3.6	−4.3	−4.6	−3.8	−3.9	−4.2	−4.0	−5.6	−5.4	−4.9	−5.2	−3.4	−3.7	−4.0

Equinox

	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
[1]	−3.2	−3.9	−2.4	−1.0	−0.9	−1.3	−2.4	−2.5	−2.6	−3.8	−4.3	−5.2	−2.0	−2.9	−4.2	−4.0
[2]	0.8	2.4	2.2	2.9	4.2	4.0	4.3	4.1	4.0	4.2	4.1	3.8	3.2	3.4	3.2	2.5
[3]	2.0	2.1	2.9	3.5	4.8	4.5	3.6	4.4	5.0	4.4	4.7	4.0	3.7	4.0	3.4	3.1
[4]	−1.2	−1.1	0.0	−0.3	−0.1	0.3	−0.1	−0.1	0.4	−0.3	−0.6	−0.4	−0.2	−0.4	−0.7	−0.5
[5]	1.9	2.2	1.7	2.2	2.6	2.2	1.9	2.3	2.3	3.0	3.0	2.8	2.7	2.6	2.2	2.1
[6]	1.3	1.7	1.5	1.3	1.6	1.9	1.5	1.8	2.1	2.2	2.2	2.0	1.9	1.8	1.4	1.2
[7]	−3.0	−3.3	−1.4	−1.2	−1.0	−0.2	−0.4	−0.8	−1.5	−2.9	−3.9	−3.8	−2.5	−2.1	−2.4	−2.4

Equinox

	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
[1]	2.3	2.5	2.6	2.4	2.1	1.8	2.0	3.5	3.5	3.0	3.6	3.8	3.9	3.5	4.1	3.6
[2]	2.4	2.4	2.3	1.5	1.2	1.2	2.5	3.3	4.0	3.4	3.8	3.9	3.1	3.7	3.4	2.9
[3]	0.3	−0.2	−0.3	0.0	0.0	0.1	−0.1	0.2	0.0	0.4	−0.1	−0.5	−0.7	−0.3	0.0	0.0
[4]	1.1	1.2	1.1	0.9	0.5	0.5	1.1	1.3	1.5	1.5	1.8	1.8	1.9	2.1	2.0	1.6
[5]	1.5	1.4	1.0	0.7	0.6	0.5	1.0	1.3	1.6	1.6	1.5	1.4	1.2	1.3	1.3	1.2
[6]	−2.1	−3.3	−2.6	−2.7	−3.2	−3.1	−2.6	−2.4	−2.8	−2.6	−3.0	−3.3	−3.0	−2.6	−2.1	−1.5
[7]																

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TABLE 54

APERIODIC STORM-TIME VARIATIONS OF DECLINATION D

(IN MINUTES)

Observatory		0	0	0	0	1	2	3	4	5	6	7	8	9	10	11
								Moderate storms								
Yakutsk	[1]	−0.1	−0.2	0.2	2.7	3.8	4.2	2.9	2.3	1.9	0.1	0.3	1.5	1.6	0.9	0.5
Kazan'	[2]	−0.3	0.2	0.1	−0.3	0.9	0.1	0.4	1.1	1.6	1.2	1.8	1.8	1.9	1.5	2.1
Sverdlovsk	[3]	−0.5	0.4	0.0	−0.4	0.6	0.3	−0.1	1.0	1.7	1.2	2.0	2.5	2.0	2.2	2.1
Irkutsk	[4]	0 0	0.1	0.0	0.7	1.3	0.8	0.6	0.6	0 5	−0.5	−0.5	−0.4	−0.3	−0.6	−0.6
Tbilisi	[5]	−0.1	0.1	0.1	0.2	0.6	0.7	0.7	0 8	1.0	1.2	1.5	1.5	1.4	1.3	1.4
Tashkent	[6]	−0.1	0.1	−0.1	0.3	0.2	0.3	0.2	0.5	0.8	0.8	0.8	0.7	0.5	0 6	0.8
Vladivostok	[7]	0.5	−0.1	−0.4	0.3	0 7	0.3	−0.7	−1.5	−0.9	−1.7	−2.1	−1.2	−1.0	−1.2	−1.7
								Intense storms								
Yakutsk	[1]	0.5	−0.3	−0.3	−0.9	−2.2	−2.1	−2.9	−3.8	−4.0	−3.9	−5.2	−5.0	−5.3	−3.9	−2.8
Kazan'	[2]	−0.6	0.1	0.4	0.9	−0.4	1.0	1.4	0.1	0.2	1.5	1.2	2.2	1.9	3.2	2.7
Sverdlovsk	[3]	−1.2	0.8	0.4	−0.4	−1.5	−0.8	0.1	−1.3	−0.5	1.4	1.9	1.7	1.9	2.7	3.4
Irkutsk	[4]	0.2	−0.2	0.1	−0.1	−0.5	−0.5	−0.6	0.0	−0.2	0.8	0.6	−0.3	−1.4	0.9	0.0
Tbilisi	[5]	−0.5	0.2	0.4	0.7	0.4	0 5	0.6	−0.2	0.5	0.4	0.5	0.7	1.1	1.6	1.4
Tashkent	[6]	−0.3	0.1	0.1	−0.3	−0.6	−0.1	0.4	0.1	0.4	1.0	1.1	0.8	0.4	0.6	0.9
Vladivostok	[7]	−0.2	−0.3	0.6	1.6	0.9	−1.5	−1.7	−2.3	−3.0	−2.4	−2.1	−2.1	−3.2	−3.1	−2.3
								Very intense storms								
Yakutsk	[1]	−0.1	0.5	−0.3	−2.6	−2.5	0.5	1.3	−0.5	−0.1	−0.8	−4.9	−6.8	−6.5	−8.7	−6.6
Kazan'	[2]	0.7	−0.6	0.0	−2.3	0.0	2.0	2.4	2.4	2.9	3.4	6.6	7.0	6.8	8.0	7.[illegible]
Sverdlovsk	[3]	0.3	−0.6	0.4	−1,4	−5.1	−1.3	1.9	3.6	4.9	5.9	8.9	10.9	9.4	7.4	7.6
Irkutsk	[4]	0.0	0.1	0.0	−0.7	−0.7	1.8	−0.1	1.1	1.2	0.2	1.1	1.6	1.8	1.9	1.[illegible]
Tbilisi	[5]	0.2	−0.2	−0.1	−1.0	−1.4	1.5	2.1	2.6	2.6	2.1	5.5	4.9	5.0	5.3	5.0
Tashkent	[6]	−0.2	−0.2	0.3	−0.9	−0.5	0.9	0.9	1.4	1.9	2.3	3.6	3.8	3.8	3.9	4.3
Vladivostok	[7]	0.4	0.2	−0.6	−0.8	−0.4	0.7	−0.6	−1.4	−1.5	−1.8	−2.0	−2.1	−2.2	−3.3	−2.1

	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
Moderate storms																
[1]	−1.0	−1.2	−0.1	−0.7	−1.7	−0.1	0.1	1.2	0.3	−0.7	−0.6	−0.5	0.1	0.4	0.8	1.4
[2]	1.0	0.3	0.8	0.9	1.6	1.9	2.8	2.3	2.4	2.6	2.3	2.5	2.7	2.8	2.1	1.7
[3]	1.4	0.9	0.4	0.9	1.2	1.8	2.4	2.8	3.3	2.5	2.8	2.8	3.3	3.2	2.0	1.8
[4]	−0.8	−0.8	−0.6	−0.2	0.1	0.4	0.6	1.0	0.3	0.1	0.1	−0.1	0.4	0.6	0.7	0.8
[5]	0.8	0.5	0.3	0.4	0.6	0.9	1.4	1.3	1.6	1.8	1.8	1.7	2.1	2.2	1.7	1.5
[6]	0.5	0.5	0.3	0.3	0.4	0.6	0.9	1.1	1.1	1.1	1.1	0.9	1.1	1.0	0.8	0.7
[7]	−1.8	−1.5	−2.0	−0.1	−0.8	−0.4	−0.3	−0.8	−1.5	−1.9	−2.4	−2.3	−1.7	−1.2	−1.1	−1.2
Intense storms																
[1]	−2.1	−3.1	−4.4	−4.1	−0.4	−3.1	−4.9	−1.4	−1.5	−2.3	−3.8	−5.5	−4.9	−5.1	−5.4	−6.1
[2]	2.2	3.8	2.4	2.7	1.8	2.2	1.8	1.8	2.5	3.3	2.7	1.6	2.5	3.3	3.5	4.1
[3]	2.8	3.5	1.0	1.7	1.9	1.7	0.6	2.9	3.8	3.5	3.2	1.6	1.0	2.9	3.0	3.0
[4]	0.5	0.7	−0.6	−0.8	0.3	−0.7	−1.4	0.3	0.0	−0.1	−0.9	−1.5	−0.6	0.5	0.2	0.1
[5]	0.9	1.3	1.3	1.1	0.8	1.2	0.4	0.7	0.8	1.2	1.5	1.0	0.7	1.4	1.4	1.7
[6]	0.8	1.4	0.8	0.9	0.9	0.8	0.3	0.9	1.2	1.4	1.3	0.6	0.8	1.4	1.6	1.7
[7]	−1.9	−1.4	−1.6	−1.3	−0.6	−1.2	−1.0	−0.7	−2.1	−3.2	−4.1	−3.9	−3.2	−2.6	−2.9	−3.6
Very intense storms																
[1]	−6.2	−10.5	−6.1	−6.3	−5.8	−2.4	−6.2	−10.5	−12.7	−10.1	−9.2	−11.6	−7.6	−8.3	−9.3	−10.0
[2]	7.6	7.3	5.6	5.4	6.4	6.8	9.1	9.7	10.2	7.5	7.7	7.9	6.9	5.1	6.0	5.7
[3]	6.4	7.7	6.4	5.5	5.3	6.1	7.7	9.9	11.4	7.1	8.2	8.4	8.1	7.4	5.4	6.2
[4]	1.5	−0.4	0.3	0.7	−0.2	2.1	2.0	0.9	0.6	0.3	−0.4	−0.7	0.4	−0.8	−1.6	−0.9
[5]	4.1	3.9	3.9	4.2	3.8	3.4	3.9	4.4	4.1	4.9	4.3	4.4	4.2	3.9	3.6	3.3
[6]	4.1	3.1	3.1	2.9	3.0	3.5	3.5	4.0	4.8	3.7	3.3	3.4	3.6	2.9	2.3	2.6
[7]	−4.1	−6.9	−3.6	−4.8	−5.0	−3.3	−3.2	−3.6	−2.9	−4.3	−5.0	−5.2	−4.4	−3.8	−3.5	−2.6

TABLE 55

EXTREMAL VALUES AND AMPLITUDES D_{st} IN H FOR THE SEASONS (GAMMAS)

Observatories	Deviation from 0 at start[1] of storm				Deviation from 0 during storm				Amplitudes			
	Year	Winter	Equinox	Summer	Year	Winter	Equinox	Summer	Year	Winter	Equinox	Summer
Yakutsk	6	6	0	10	—41	—58	—46	—37	47	64	46	47
Kazan'	13	10	12	16	—38	—49	—37	—31	51	59	49	47
Sverdlovsk	16	17	15	17	—42	—53	—46	—34	58	70	61	51
Irkutsk	19	12	13	20	—49	—68	—55	—40	68	80	68	60
Tbilisi	14	14	17	15	—46	—63	—50	—37	60	77	67	52
Tashkent	12	—1	15	14	—53	—76	—54	—43	65	75	69	57
Vladivostok	8	15	10	7	—55	—76	—65	—40	63	91	75	47

1. Values during first 3 hours after beginning of storm assumed equal to 0

Observatories	Deviations from 0 at start of storm			Deviations from 0 during storm			Amplitudes		
	Moderate	Intense	Very intense	Moderate	Intense	Very intense	Moderate	Intense	Very intense
Yakutsk	12	1	14	—21	—47	—94	33	48	108
Kazan'	12	8	26	—20	—45	—58	32	53	84
Sverdlovsk	12	11	33	—21	—53	—68	33	64	101
Irkutsk	12	13	22	—30	—54	—90	42	67	112
Tbilisi	12	7	19	—28	—44	—77	40	51	96
Tashkent	15	5	9	—27	—45	—90	42	50	99
Vladivostok	—	8	12			—100			112

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TABLE 57

EXTREMAL VALUES AND AMPLITUDES D_{st} IN Z FOR SEASONS (GAMMAS)

Observatories	Deviation from 0 at start of storm[1]				Deviation from 0 during storm				Amplitudes			
	Year	Winter	Equinox	Summer	Year	Winter	Equinox	Summer	Year	Winter	Equinox	Summer
Kazan'	−9	−7	−13	−3	12	14	11	10	21	21	24	13
Sverdlovsk	−8	0	−14	−3	12	15	12	10	20	15	26	13
Irkutsk	−4	−4	−8	2	10	11	10	10	14	15	18	8
Tbilisi	2	−2	−4	0	8	12	9	8	10	14	13	8
Tashkent	2	1	−4	2	12	15	12	10	10	14	16	8
Vladivostok	−2		−4	−2	12		8	5	14		12	7

TABLE 58

EXTREMAL VALUES AND AMPLITUDES D_{st} IN Z BY STORM CATEGORIES (GAMMAS)

Observatories	Deviations from 0 at start of storm			Deviations from 0 during storm			Amplitudes		
	Moderate	Intense	Very intense	Moderate	Intense	Very intense	Moderate	Intense	Very intense
Kazan'	−3	−16	8	9	−1	−15; 25[1]	12	15	40
V. Dubrava	−1	−8	7	7	0	−20; 27[1]	8	8	47
Irkutsk	0	−4	0	4	6	−5; 13[1]	4	10	18
Tbilisi	−1	−5	0	5	6	19	6	11	19
Tashkent	−2	2	3	6	10	22	4	8	19
Vladivostok	−1	−2	−8	3	5	28	4	7	36

1. These values show to what extent the value of the variation decreased below the value prior to the storm, after increasing during the first hours of the storm. The above-mentioned minimum was again followed by a growth in the values to a maximum, the value of which is given to the right

TABLE 59

EXTREMAL VALUES AND AMPLITUDES D_{st} IN THE DECLINATION FOR THE SEASONS (IN MINUTES)

Observatories	Deviation from 0 at start of storm				Deviation from 0 during storm				Amplitudes			
	Year	Winter	Equinox	Summer	Year	Winter	Equinox	Summer	Year	Winter	Equinox	Summer
Yakutsk	−0.8	1.0	−1.1	0.6	−4.0	−4.0	−5.0	−2.5	3.8	5.0	3.9	3.1
Kazan'	−0.6	−0.6	−0.8	0.0	4.4	9.0	4.2	4.0	5.0	9.6	5.0	4.0
Sverdlovsk	−1.0	0.4	−1.0	−1.8	5.2	7.0	5.0	4.0	4.2	6.6	6.0	5.8
Irkutsk	0.0	0.8	0.0	0.0	0.6	1.0	−0.6	−0.8	0.6	1.8	0.6	0.8
Tbilisi	−0.2	−0.6	0.2	−0.8	2.2	4.0	2.8	1.8	2.0	4.6	2.6	1.0
Tashkent	−0.2	−0.4	−0.8	−0.8	2.4	4.0	2.2	1.4	2.2	4.4	3.0	0.6
Vladivostok	0.2	0.0	0.0	0.4	−3.8	−4.0	−3.6	−1.6	4.0	4.0	3.6	2.0

TABLE 60

EXTREMAL VALUES AND AMPLITUDES D_{st} IN THE DECLINATION BY STORM CATEGORIES (MINUTES)

Observatories	Deviations from 0 at start of storm			Deviations from 0 during storm			Amplitudes		
	Moderate	Intense	Very intense	Moderate	Intense	Very intense	Moderate	Intense	Very intense
Yakutsk	1.8	−2.2	−2.0	−0.4	−5.4	−11.4	2.2	3.2	9.4
Kazan'	0.8	−0.4	0.0	2.6	3.2	9.6	3.4	3.6	9.6
Sverdlovsk	0.6	−1.6	−3.2	2.8	3.6	10.0	3.4	5.2	13.8
Irkutsk	1.2	−0.4	0.0	0.0	0.2	3.0	1.2	0.6	3.0
Tbilisi	1.4	0.4	−0.4	1.8	1.6	4.4	3.2	1.2	4.8
Tashkent	0.2	−0.6	−0.2	1.0	1.6	4.4	1.2	2.2	4.6
Vladivostok	0.8	1.0	0.0	−2.0	−3.2	−3.4	2.8	4.2	3.4

TABLE 61

APERIODIC STORM-TIME VARIATIONS OF NORTHERN COMPONENT (X) (GAMMAS)

Observatory		0	0	0	0	1	2	3	4	5	6	7	8	9	10	11
Year																
Yakutsk	[1]	0	0	1	5	0	2	−11	−11	−18	−27	−34	−34	−26	−25	−23
Kazan'	[2]	1	0	0	11	13	4	−4	−10	−12	−14	−19	−24	−16	−23	−20
Sverdlovsk	[3]	2	−1	0	13	17	4	−5	−14	−19	−19	−27	−32	−30	−32	−25
Irkutsk	[4]	3	3	−7	16	19	7	−6	−21	−14	−18	−26	−31	−33	−34	−33
Tbilisi	[5]	1	0	0	14	14	0	−7	−12	−15	−20	−23	−25	−28	−32	−35
Tashkent	[6]	0	−1	0	7	12	2	−9	−15	−17	−21	−29	−30	−31	−37	−40
Vladivostok	[7]	0	−1	2	8	8	4	−8	−12	−16	−21	−26	−33	−48	−49	−47
Winter																
Yakutsk	[1]	−1	0	0	7	4	−1	−1	1	4	−8	−22	−32	−25	−40	−36
Kazan'	[2]	1	0	1	9	11	−1	−6	−8	−7	−14	−19	−18	−25	−33	−35
Sverdlovsk	[3]	0	−1	2	13	16	4	−2	−9	−12	−15	−30	−40	−36	−45	−35
Irkutsk	[4]	−5	−1	7	12	11	1	−10	−10	−11	−14	−26	−41	−51	−52	−42
Tbilisi	[5]	0	−2	2	14	12	−3	−11	−10	−16	−18	−31	−33	−36	−44	−42
Tashkent	[6]	−2	−1	2	−2	−2	−7	−12	−17	−17	−17	−24	−26	−28	−39	−38
Vladivostok	[7]	3	2	−1	3	9	13	−5	−9	−5	−16	−22	−45	−58	−62	−55
Equinox																
Yakutsk	[1]	0	0	−1	−2	−11	−10	−15	−27	−37	−46	−56	−47	−30	−28	−24
Kazan'	[2]	1	0	−1	13	10	3	7	−19	−24	−25	−27	−36	−31	−31	−29
Sverdlovsk	[3]	2	−1	0	12	15	1	−18	−32	−42	−37	−40	−46	−40	−42	−37
Irkutsk	[4]	0	0	0	13	13	−1	−22	−27	−31	−35	−40	−40	−46	−44	−44
Tbilisi	[5]	0	0	1	16	15	−7	−14	−23	−26	−30	−24	−33	−33	−35	−46
Tashkent	[6]	0	1	0	12	14	1	−19	−27	−28	−36	−39	−40	−42	−46	−56
Vladivostok	[7]	−4	0	3	9	9	4	−9	−13	−20	−25	−26	−30	−58	−60	−56
Summer																
Yakutsk	[1]	0	−1	1	11	8	−3	−11	−4	−13	−18	−20	−24	−22	−18	−19
Kazan'	[2]	3	0	−2	10	16	8	2	0	−2	−4	−11	−14	−11	−12	−5
Sverdlovsk	[3]	2	−2	−1	13	18	12	4	1	0	−5	−13	−14	−16	−17	−19
Irkutsk	[4]	2	0	0	12	20	9	3	−1	−6	−11	−20	−25	−21	−24	−23
Tbilisi	[5]	2	0	−1	12	15	8	1	−3	−5	−10	−19	−15	−19	−24	−23
Tashkent	[6]	1	0	−1	6	14	7	0	−3	−6	−10	−22	−22	−22	−27	−27
Vladivostok	[7]	5	−2	−1	7	6	−2	−8	−12	−12	−18	−27	−30	−29	−28	−28

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12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28

Year

	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
[1]	-25	-24	-28	-32	-33	-36	-34	-31	-36	-40	-40	-41	-41	-42	-41	-40
[2]	-23	-28	-30	-29	-32	-34	-35	-35	-32	-34	-34	-36	-41	-40	-36	-35
[3]	-28	-31	-31	-24	-28	-36	-37	-38	-36	-34	-42	-42	-45	-43	-38	-39
[4]	-37	-40	-40	-40	-38	-44	-42	-42	-45	-48	-48	-44	-47	-42	-42	-41
[5]	-37	-39	-42	-41	-41	-43	-41	-43	-41	-45	-47	-44	-47	-42	-40	-41
[6]	-42	-42	-45	-45	-46	-51	-51	-51	-52	-54	-54	-53	-53	-52	-47	-46
[7]	-46	-44	-45	-41	-45	-47	-44	-51	-56	-63	-72	-68	-67	-63	-59	-53

Winter

	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
[1]	-33	-25	-33	-46	-52	-58	-56	-51	-51	-44	-41	-38	-38	-32	-33	-26
[2]	-37	-34	-33	-33	-31	-43	-44	-51	-54	-49	-48	-45	-53	-49	-44	-44
[3]	-47	-51	-32	-34	-42	-48	-50	-55	-61	-52	-56	-51	-55	-37	-28	-36
[4]	-49	-45	-50	-50	[illegible]	-64	-63	-68	-63	-66	-56	-59	-66	-49	-48	-43
[5]	-45	-43	-45	-39	-43	-52	-47	-58	-65	-61	-61	-49	-56	-44	-43	-39
[6]	-33	-37	-48	-53	-48	-67	-66	-78	-78	-73	-65	-68	-69	-62	-57	-55
[7]	-48	-45	-54	-47	-55	-60	-72	-83	-85	-75	-108	-112	-110	-109	-99	-89

Equinox

	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
[1]	-25	-20	-24	-27	-33	-34	-31	-29	-35	-47	-44	-47	-44	-50	-49	-49
[2]	-29	-36	-36	-28	-35	-33	-33	-34	-30	-34	-33	-34	-47	-42	-38	-38
[3]	-33	-36	-36	-31	-34	-35	-35	-37	-33	-30	-44	-44	-54	-53	-46	-48
[4]	-51	-58	-52	-50	-46	-50	-46	-51	-53	-54	-60	-53	-55	-53	-53	-55
[5]	-51	-51	-51	-49	-47	-47	-41	-44	-38	-48	-51	-48	-56	-51	-47	-51
[6]	-55	-55	-56	-51	-53	-54	-53	-52	-54	-58	-59	-58	-61	-60	-54	-55
[7]	-59	-57	-59	-52	-48	-48	-42	-49	-62	-78	-76	-72	-69	-72	-67	-66

Summer

	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
[1]	-25	-33	-31	-33	-28	-29	-30	-27	-33	-34	-39	-40	-40	-39	-39	-38
[2]	-12	-18	-24	-28	-29	-31	-32	-30	-26	-28	-32	-34	-30	-32	-31	-28
[3]	-16	-19	-26	-26	[illegible]	-32	-34	-33	-30	-30	-34	-37	-34	-36	-34	-30
[4]	-27	-27	-32	-33	-33	-38	-38	-36	-36	-42	-39	-37	-38	-36	-35	-33
[5]	-21	-26	-31	-34	-33	-34	-38	-36	-35	-38	-38	-38	-35	-32	-33	-31
[6]	-33	-32	-34	-36	-38	-40	-42	-43	-40	-43	-44	-42	-41	-40	-37	-35
[7]	-25	-23	-24	-28	-36	-40	-35	-34	-33	-36	-44	-41	-38	-34	-27	-24

TABLE 62

APERIODIC STORM-TIME VARIATIONS OF NORTHERN COMPONENT (X) (GAMMAS)

		0	0	0	0	1	2	3	4	5	6	7	8	9	10	11
Moderate storms																
Yakutsk	[1]	−3	−1	4	12	17	14	8	2	−8	−17	−19	−16	−14	−15	−16
Kazan'	[2]	3	−2	−2	11	11	8	4	−3	−3	−5	−10	−13	−12	−13	−11
Sverdlovsk	[3]	2	−2	0	13	12	8	4	0	−2	−6	−15	−20	−19	−18	−16
Irkutsk	[4]	−1	−1	−2	13	12	4	−1	−4	−11	−16	−23	−24	−23	−23	[illegible]
Tbilisi	[5]	1	−1	−1	12	12	5	2	−8	−11	−10	−19	−19	−17	−18	[illegible]
Tashkent	[6]	0	−1	2	9	1	5	0	−5	−10	−10	−21	−20	−18	−19	−17
Vladivostok	[7]	2	−4	4	12	24	23	19	17	8	−4	−16	−22	−19	−20	−21
Intense storms																
Yakutsk	[1]	4	2	−6	0	−10	−24	−23	−18	−14	−29	−36	−37	−12	−14	17
Kazan'	[2]	0	−1	0	7	7	−6	−8	−7	−3	−7	−9	−13	−14	−25	30
Sverdlovsk	[3]	2	−2	−1	11	10	1	−6	−6	−2	−8	−9	−12	−14	−23	−30
Irkutsk	[4]	3	−1	−1	13	13	1	−4	−9.	−7	−8	−12	−15	−12	−22	−27
Tbilisi	[5]	−1	−3	4	6	5	0	−7	−7	−11	−13	−17	−15	−15	−25	−28
Tashkent	[6]	1	−1	0	5	−2	1	−5	−9	−5	−14	−16	−15	−15	−27	−34
Vladivostok	[7]	−1	2	−1	8	−17	−32	−35	−38	−36	−28	−34	−42	−50	−59	−53
Very intense storm																
Yakutsk	[1]	−1	0	2	10	6	−1	−27	−23	−47	−50	−68	−72	−70	−61	−41
Kazan'	[2]	−4	0	3	20	26	11	−4	−23	−24	−31	−35	−42	−46	−36	−31
Sverdlovsk	[3]	−4	1	4	21	38	17	−2	−29	−33	−38	−56	−73	−74	−62	−38
Irkutsk	[4]	−2	1	2	18	22	10	−18	−33	−36	−47	−55	−67	−87	−70	−57
Tbilisi	[5]	2	−2	−1	18	19	−4	−19	−30	−32	−33	−46	−46	−67	−62	−61
Tashkent	[6]	1	0	−2	9	8	3	−18	−34	−34	−38	−48	−52	−61	−69	−65
Vladivostok	[7]	0	0	−1	3	10	9	−18	−24	−26	−36	−31	−38	−82	−78	−72

	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
Moderate storms																	
[1]	−17	−16	−12	−16	−21	−18	−14	−17	−18	−19	−22	−16	−14	−15	−17	−19	
[2]	−12	−14	−15	−14	−17	−22	−22	−20	−17	−18	−22	−22	−20	−17	−14	−17	
[3]	−14	−14	−16	−15	−17	−21	−20	−20	−18	−18	−24	−24	−24	−17	−16	−18	
[4]	−21	−19	−21	−21	−19	−25	−25	−24	−25	−29	−30	−26	−25	−20	−20	−22	
[5]	−16	−16	−18	−20	−21	−24	−23	−25	−24	−27	−27	−27	−29	−23	−23	−21	
[6]	−19	−19	−21	−22	23	−27	−28	−27	−29	−30	−28	−26	−28	−25	−23	−23	
[7]	−14	−13	−11	−10	−15	−25	−27	−30	−31	−37	−40	−33	−26	−14	−8	−7	
Intense storms																	
[1]	−16	−28	−40	−40	−26	−32	−40	−35	−42	−40	−37	−40	−46	−51	−49	−37	
[2]	−29	−28	−32	−30	−28	−29	−28	−29	−29	−37	−37	−35	−41	−47	−43	−38	
[3]	−28	−22	−21	−30	−32	−29	−33	−35	−46	−50	−41	−44	−46	55	−51	−45	
[4]	−30	−26	−33	−29	−28	−35	−35	−37	−45	−51	−51	−48	−48	−53	−55	−48	
[5]	−32	−29	−34	−27	−24	−32	−26	−35	−38	−38	−37	−34	−39	−45	−44	−42	
[6]	−32	−35	−37	−34	−36	−40	−36	−42	−48	−49	−50	−47	−49	−55	−49	−49	
[7]	−45	−34	−56	−58	−46	−52	−48	−50	−70	−85	−87	−84	−84	−94	−92	−81	
Very intense storm																	
[1]	−41	−38	−48	−59	−69	−82	−76	−62	−73	−89	−89	−103	−98	−88	−75	−86	
[2]	−38	−32	−36	−44	−46	−45	−48	−58	−53	−53	−52	−69	−61	−60	−55	−57	
[3]	−56	−60	−52	−42	−46	−49	−58	−67	−61	−44	−62	−65	−70	−74	−54	−61	
[4]	−69	−61	−63	−72	−69	−73	−69	−84	−75	−77	−76	−77	−93	−86	−82	−75	
[5]	−55	−59	−63	−64	−64	−65	−63	−62	−61	−72	−77	−70	−79	−79	−71	−72	
[6]	−64	−65	−71	−75	−69	−80	−84	−82	−88	−90	−81	−88	−92	−90	−86	−82	
[7]	−83	−87	−82	−79	−77	−68	−68	−77	−73	−76	−97	−96	−103	−99	−93	−99	

TABLE 63

APERIODIC STORM-TIME VARIATIONS OF EASTERN COMPONENT (Y) (GAMMAS)

Observatory		0	0	0	0	1	2	3	4	5	6	7	8	9	10	11	12
							Year										
Yakutsk	[1]	1	−1	0	−4	−3	5	6	1	8	4	1	1	−2	−4	−3	
Kazan'	[2]	0	0	1	−2	3	2	3	2	3	6	10	10	12	12	13	
Sverdlovsk	[3]	−3	0	0	−2	2	−2	0	−1	2	7	10	12	9	9	10	
Irkutsk	[4]	0	0	1	−1	0	2	0	0	1	−1	0	−1	−1	−1	0	
Tbilisi	[5]	−1	1	0	0	−1	3	4	4	6	8	12	12	12	13	[illegible]	
Tashkent	[6]	−1	1	0	−4	−1	2	1	2	4	7	9	8	7	8	[illegible]	
Vladivostok	[7]	2	−1	−3	0	1	−3	−7	−12	−11	−13	−13	−9	−8	−12	[illegible]	
							Winter										
Yakutsk	[1]	4	−5	2	3	8	20	19	23	18	19	18	12	16	10	7	
Kazan'	[2]	0	−2	1	−1	−6	1	7	10	16	19	30	27	34	54	49	
Sverdlovsk	[3]	−4	−2	5	3	6	10	4	6	14	25	34	26	24	31	32	
Irkutsk	[4]	−4	−1	4	3	4	13	8	13	13	11	20	11	14	16	[illegible]	
Tbilisi	[5]	0	0	0	−3	−11	0	1	5	6	11	19	17	21	29	3[illegible]	
Tashkent	[6]	−1	−1	2	−3	6	8	4	6	10	13	22	18	24	28	2[illegible]	
Vladivostok	[7]	−2	0	−1	−1	−5	−12	−2	−4	−12	−11	−12	−12	−22	18	−2[illegible]	
							Equinox										
Yakutsk	[1]	0	0	1	−12	−12	6	3	−8	0	−4	−4	−7	−10	−9	[illegible]	
Kazan'	[2]	−3	1	2	−5	5	3	2	0	−3	0	2	2	4	6	2	
Sverdlovsk	[3]	−4	1	0	0	−2	−4	0	−2	−2	4	7	8	6	1	[illegible]	
Irkutsk	[4]	−1	0	0	−5	0	1	−5	−6	−6	−7	−10	−8	−10	−10	[illegible]	
Tbilisi	[5]	−3	1	2	5	5	6	7	6	8	9	14	11	11	9	[illegible]	
Tashkent	[6]	−2	1	0	−5	−2	1	1	3	3	7	6	5	4	1	[illegible]	
Vladivostok	[7]	0	−2	0	−2	2	3	−4	−10	−8	−9	−9	−7	−5	−16	[illegible]	
							Summer										
Yakutsk	[1]	1	0	−3	1	0	2	2	2	2	6	1	4	−1	−4	−8	
Kazan'	[2]	1	−1	1	1	4	2	3	0	5	9	11	14	10	11	10	
Sverdlovsk	[3]	0	2	−2	−5	−4	−2	0	−2	2	4	7	1	8	10	8	
Irkutsk	[4]	1	0	−1	0	−1	−2	0	0	1	0	0	1	1	1	1	
Tbilisi	[5]	0	1	−1	0	−2	2	4	2	4	7	9	11	10	11	7	
Tashkent	[6]	−1	0	0	−3	−2	0	2	1	2	4	8	7	3	6	9	
Vladivostok	[7]	3	0	−8	2	4	−7	−12	−17	−15	−17	−19	−13	−9	−4	−6	

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	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
Year																
[1]	−4	−5	−3	−3	2	3	−2	−1	−3	−2	−2	−5	0	−1	−4	−4
[2]	9	11	10	11	12	11	14	15	16	13	14	13	12	12	13	10
[3]	6	10	7	7	10	8	9	12	17	13	12	11	9	10	7	5
[4]	0	−1	0	0	0	2	2	4	3	2	0	−1	0	0	0	0
[5]	10	10	9	10	10	9	9	10	10	13	14	13	12	13	11	9
[6]	10	10	7	6	6	7	7	10	12	11	10	9	8	7	6	5
[7]	−14	−19	−10	−10	−11	−6	−6	−6	−9	−15	−19	−19	−13	−10	−11	−9
Winter																
[1]	4	3	1	−6	3	10	8	13	8	4	9	7	7	−1	0	6
[2]	42	38	34	32	33	39	38	40	42	34	30	28	31	32	26	28
[3]	19	38	20	19	22	20	22	28	30	23	21	21	20	23	11	10
[4]	6	8	4	−2	−2	3	11	21	8	4	2	4	10	5	3	7
[5]	23	20	23	23	24	24	23	20	16	19	16	18	14	16	8	9
[6]	23	18	17	18	19	18	18	24	23	16	14	14	15	12	8	11
[7]	−21	−23	−20	−27	−28	−21	−20	−20	−28	−33	−26	−22	−23	−10	−14	−18
Equinox																
[1]	−6	−11	−3	4	6	5	−1	−2	0	−2	−5	−8	5	3	−3	−2
[2]	−1	6	5	9	15	14	15	14	14	15	14	13	8	10	9	6
[3]	2	2	6	10	15	13	9	12	16	14	12	9	5	7	6	4
[4]	−6	−5	1	−1	0	2	0	0	3	−1	−3	−2	0	−2	−3	−2
[5]	9	11	8	11	14	11	10	12	13	17	17	16	14	14	11	10
[6]	1	8	6	1	7	9	6	9	11	11	11	10	9	8	6	4
[7]	−15	−17	−2	−2	0	6	3	1	−2	−11	−19	−19	−9	−6	−9	−9
Summer																
[1]	−5	−12	−4	−8	−4	−2	−6	−7	−10	−4	−3	−7	−7	−5	−6	−9
[2]	9	9	9	7	5	4	4	12	13	10	12	13	14	12	15	13
[3]	8	7	5	1	0	−2	4	8	12	9	10	10	7	9	8	7
[4]	2	−1	−1	0	0	1	0	2	0	3	0	−2	−4	−1	0	0
[5]	6	6	5	3	1	0	4	6	8	7	9	9	10	12	11	9
[6]	8	8	4	2	1	0	4	6	8	8	7	7	5	6	6	6
[7]	−13	−23	−17	−17	−20	−18	−15	−14	−17	−15	−17	−20	−18	−15	−12	−8

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TABLE 64

APERIODIC STORM-TIME VARIATIONS OF EASTERN COMPONENT (Y) (GAMMAS).

		0	0	0	1	2	3	4	5	6	7	8	9	10	11	12
						Moderate storms										
Yakutsk	[1]	0	0	0	8	11	14	10	10	11	6	7	12	12	9	
Kazan'	[2]	−1	1	0	0	6	2	3	5	7	5	7	7	7	5	5
Sverdlovsk	[3]	−2	1	0	1	6	3	0	5	8	4	6	8	5	6	6
Irkutsk	[4]	0	1	0	4	7	4	3	3	3	−3	−2	−2	−1	−3	−3
Tbilisi	[5]	−1	1	1	2	5	5	5	5	6	8	9	9	8	8	9
Tashkent	[6]	−1	1	0	−1	3	3	2	3	5	5	4	3	2	3	4
Vladivostok	[7]	4	0	−4	0	2	−1	−8	−14	−8	−13	−14	−6	−5	−6	−10
						Intense storms										
Yakutsk	[1]	1	−2	1	−4	−6	−2	−6	−11	−13	−8	−12	−10	−20	−13	−7
Kazan'	[2]	−3	0	2	6	−1	4	6	−1	0	6	4	9	7	11	6
Sverdlovsk	[3]	−5	3	2	1	−5	−4	−1	−8	−3	5	7	5	6	8	9
Irkutsk	[4]	1	−1	1	−1	−3	−3	−3	0	−1	4	3	−2	−8	5	0
Tbilisi	[5]	−4	1	3	5	3	4	4	−2	2	2	2	4	6	9	7
Tashkent	[6]	−2	1	1	−2	−5	−1	3	0	3	6	7	5	2	2	4
Vladivostok	[7]	−1	−3	5	12	10	−7	−8	−12	−18	−15	−11	−10	−18	−15	−10
						Very intense storms										
Yakutsk	[1]	0	2	−2	−15	−13	3	14	5	14	12	0	−8	−7	−19	−10
Kazan'	[2]	3	−3	0	−8	4	12	11	8	10	11	26	27	25	33	33
Sverdlovsk	[3]	0	−3	3	−2	−16	−2	9	10	16	19	30	35	28	21	25
Irkutsk	[4]	0	1	0	−3	−3	10	0	6	7	2	7	10	11	11	8
Tbilisi	[5]	2	−2	−1	−5	−8	11	13	16	16	12	35	30	29	32	30
Tashkent	[6]	−1	−2	2	−6	−3	7	5	7	11	14	22	24	23	23	26
Vladivostok	[7]	3	2	−5	−7	−5	−1	−2	−7	−8	−9	−11	−11	−5	−14	−6

	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
						Moderate storms										
[1]	1	0	4	2	−1	5	5	10	7	3	4	3	5	6	9	12
[2]	3	−1	1	2	5	6	10	8	9	10	8	8	10	11	8	5
[3]	4	1	−2	1	2	4	7	9	12	8	8	8	10	11	6	4
[4]	−4	−4	−3	−1	1	2	4	6	2	1	1	−2	2	4	4	5
[5]	4	2	0	1	2	4	8	7	9	10	10	10	12	14	10	8
[6]	2	2	0	0	1	2	4	6	6	6	6	4	6	5	4	3
[7]	−12	−10	−14	1	−4	1	2	−2	−7	−9	−13	−13	−9	−7	−7	−8
						Intense storms										
[1]	−4	−5	−7	−6	6	−4	−9	5	7	2	−5	−12	−7	−6	−9	−15
[2]	6	14	6	8	4	6	4	4	7	10	7	2	5	8	10	14
[3]	7	12	0	1	2	0	−5	6	8	5	6	−2	−6	1	2	4
[4]	3	3	−3	−4	2	−2	−7	2	0	0	−4	−8	−3	3	2	1
[5]	4	7	6	5	4	6	0	2	2	5	7	4	2	6	6	8
[6]	3	7	3	4	3	2	−1	3	5	6	5	0	2	6	8	8
[7]	−8	−6	−4	−3	2	−2	0	2	−6	−12	−19	−18	−12	−6	−9	−16
						Very intense storms										
[1]	−14	−34	−12	−10	−4	15	−4	−27	−33	−37	−13	−18	−3	−9	−14	−17
[2]	31	30	21	19	24	26	36	38	41	28	29	29	23	14	20	18
[3]	18	23	19	17	15	18	23	32	40	24	25	25	22	18	13	16
[4]	9	−1	2	4	0	12	12	6	4	3	−1	−2	3	−3	−8	−4
[5]	24	22	22	24	21	18	22	26	24	28	23	25	23	21	19	17
[6]	25	17	17	15	16	19	18	22	28	19	17	17	18	14	9	12
[7]	−29	−41	−16	−26	−28	−16	−15	−16	−12	−22	−25	−26	−19	−15	−12	−7

TABLE 65

APERIODIC GEOMAGNETIC STORM-TIME VARIATIONS IN HORIZONTAL COMPONENT

H FOR GEOMAGNETIC LATITUDES (IN GAMMAS)

Φ°	0	1	2	3	4	5	6	7	8		10	11	12
70	-17	-10	-10	-14	-17	-17	-13	-20		15	-37	-48	-41
65	-35	-32	-40	-25	-20	-27	-21	-25	-20	-23	-35	-40	-43
60	12	19	33	23	5	-10	-6	-34	-40	-45	-60	-55	-62
55	-10	-15	-17	-22	-22	-29	-33	-37	-35	-45	-40	-35	-34
50	4	5	-2	-9	-14	-19	-22	-27	-27	-26	-24	-24	-25
45	8	12	4	2	-15	-18	-20	-24	-28	-27	-27	-30	-32
40	7	10	3	-9	-16	-19	-22	-25	-30	-30	-35	-37	-38
35	4	6	1	-10	-17	-20	-24	-27	-31	-33	-38	-41	-43
30	1	2	-2	-12	-18	-22	-26	-29	-33	-37	-39	-41	-43

14	15	16	17	18	19	20	21	22	23	24	25	26	27
-48	-53	-55	-50	-45	-52	-64	-60	-47	-46	-43	-39	-40	-34
-40	-40	-50	-48	-49	-40	-40	-45	-57	-59	-47	-43	-45	-45
-68	-67	-82	-96	-98	-90	-84	-63	-61	-55	-48	-46	-45	-45
-39	-42	-49	-51	-56	-50	-50	-46	-48	-50	-44	-44	-43	-42
-27	-29	-31	-32	-35	-35	-35	-35	-36	-38	-40	-41	-40	-39
-37	-37	-36	-35	-39	-43	-43	-40	-41	-44	-44	-44	-43	-41
-42	-42	-43	-43	-44	-47	-49	-49	-50	-50	-50	-49	-46	-44
-44	-45	-46	-47	-49	-50	-52	-53	-54	-54	-54	-53	-50	-48
-45	-47	-48	-49	-51	-52	-53	-54	-56	-57	-57	-57	-54	-52

TABLE 66

GEOMAGNETIC AND SOLAR ACTIVITY, 1938-1948

Year	Number of magnetic storms	u-measure[2]	Three-ball characteristic[3]	K-index[4]	Number of sunspot groups[5]	Relative number of sunspots
1938	41	1.41	0.79	2.34	9.5	109.6
1939	37	1.37	0.79	2.30	8.5	88.8
1940	31	1.33	0.72	2.31	6.5	67.8
1941	23	1.26	0.66	2.48	4.3	47.5
1942	21	0.99	0.64	2.29	3.0	30.6
1943	34	0.98	0.68	2.54	1.5	16.3
1944	16	0.86	0.40	2.00	1.0	9.6
1945	21	0.99	0.35	1.91	3.4	33.2
1946	30	1.45	0.53	2.34	7.8	92.6
1947	29	1.52	0.62	2.72	12.3	151.5
1948	35	1.23	0.47	2.60	10.9	136.3
Average	29	1.22	0.60	2.35	6.2	71.3

1. Summary catalogue of this handbook. 2. 1938 according to Bartels; following years according to data from 5 observatories: Tashkent, Tbilisi, Kazan', Irkutsk, Sverdlovsk. 3. According to data from 16 USSR observatories. 4. According to data from 3 observatories; Tashkent Kazan', Srednikan. 5. Average number of sunspot groups, seen on the sun at one time, according to Mount-Wilson observatory.

TABLE 67

AVERAGE-MONTHLY VALUES OF THREE-BALL CHARACTERISTICS AS PER DATA FROM THE FOLLOWING MAGNETIC OBSERVATORIES: VLADIVOSTOK, TASHKENT, TBILISI, IRKUTSK, SVERDLOVSK, KAZAN', YAKUTSK, SREDNIKAN, MOSCOW, AND LENINGRAD

	Month												Season			
Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	winter	equinox	summer	year
1938	1.34	0.75	0.50	0.61	0.50	0.33	0.48	0.59	0.69	0.62	0.41	0.53	0.76	0.60	0.48	0.61
1939	0.38	0.75	0.72	0.85	0.75	0.62	0.69	0.52	0.52	0.74	0.27	0.51	0.48	0.71	0.64	0.61
1940	0.71	0.58	0.64	0.57	0.47	0.48	0.35	0.36	0.51	0.53	0.71	0.63	0.66	0.57	0.42	0.55
1941	0.57	0.62	0.84	0.44	0.30	0.41	0.47	0.44	0.65	0.37	0.57	0.38	0.54	0.58	0.41	0.51
1942	0.35	0.40	0.68	0.54	0.27	0.32	0.47	0.49	0.60	0.70	0.57	0.49	0.45	0.63	0.39	0.49
1943	0.40	0.36	0.49	0.40	0.41	0.45	0.51	0.74	0.63	0.67	0.68	0.46	0.48	0.55	0.53	0.52
1944	0.44	0.38	0.58	0.43	0.32	0.27	0.13	0.19	0.17	0.27	0.17	0.41	0.35	0.36	0.23	0.31
1945	0.28	0.27	0.49	0.35	0.15	0.15	0.25	0.17	0.25	0.27	0.15	0.47	0.29	0.34	0.18	0.27
1946	0.35	0.50	0.72	0.35	0.40	0.38	0.50	0.22	0.60	0.26	0.34	0.26	0.36	0.48	0.38	0.41
1947	0.36	0.27	0.66	0.32	0.34	0.34	0.29	0.56	0.73	0.50	0.25	0.46	0.26	0.55	0.38	0.49
1948	0.26	0.35	0.36	0.23	0.34	0.17	0.22	0.43	0.38	0.72	0.45	0.41	0.37	0.42	0.29	0.36
Average	0.49	0.48	0.61	0.46	0.39	0.36	0.40	0.43	0.52	0.51	0.42	0.43	0.46	0.52	0.40	0.46

(Remark: Leningrad to 1 July 1941: Moscow since March 1945)

TABLE 68

AVERAGE-MONTHLY VALUES OF THREE-BALL CHARACTERISTICS AS PER DATA FROM THE FOLLOWING MAGNETIC OBSERVATORIES

VLADIVOSTOK, TASHKENT, TBILISI, IRKUTSK, SVERDLOVSK, KAZAN', YAKUTSK, SREDNIKAN, MOSCOW, AND LENINGRAD

	Month												Season			
Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Winter	Equinox	Summer	Year
1938	1.74	0.98	0.65	0.79	0.65	0.43	0.62	0.77	0.90	0.81	0.53	0.69	0.99	0.78	0.62	0.79
1939	0.49	0.98	0.94	1.10	0.98	0.81	0.90	0.68	0.68	0.96	0.35	0.66	0.62	0.92	0.83	0.79
1940	0.92	0.75	0.83	0.74	0.61	0.62	0.46	0.47	0.70	0.69	0.92	0.82	0.86	0.74	0.55	0.72
1941	0.74	0.81	1.09	0.57	0.39	0.57	0.61	0.57	0.84	0.48	0.74	0.49	0.70	0.75	0.53	0.66
1942	0.46	0.52	0.88	0.70	0.35	0.42	0.61	0.64	0.78	0.91	0.74	0.64	0.58	0.82	0.51	0.64
1943	0.52	0.47	0.64	0.52	0.53	0.58	0.66	0.96	0.82	0.87	0.88	0.60	0.62	0.72	0.69	0.65
1944	0.57	0.49	0.75	0.56	0.42	0.35	0.17	0.25	0.22	0.35	0.22	0.53	0.46	0.47	0.30	0.40
1945	0.36	0.35	0.64	0.46	0.20	0.17	0.32	0.22	0.32	0.35	0.20	0.61	0.38	0.44	0.23	0.35
1946	0.46	0.65	0.94	0.46	0.52	0.49	0.65	0.29	0.78	0.34	0.44	0.34	0.47	0.62	0.49	0.53
1947	0.47	0.35	0.86	0.42	0.44	0.44	0.38	0.73	0.95	0.65	0.33	0.21	0.31	0.72	0.49	0.52
1948	0.34	0.46	0.47	0.30	0.44	0.22	0.29	0.56	0.49	0.94	0.58	0.53	0.48	0.55	0.38	0.47
Average	0.64	0.62	0.79	0.60	0.51	0.47	0.52	0.56	0.68	0.66	0.55	0.56	0.60	0.68	0.52	0.60

(Remarks: 1. Table obtained by multiplying the data of Table 67 by a factor of 1.3, which takes into account the data from the polar observatories. 2. Leningrad to 1 July 1941, Moscow since March 1945.

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TABLE 69

SCALES OF THE K-INDEX AND NUMBER OF YEARS FOR WHICH K-INDEX MATERIALS ARE USED

Serial No	Observatory	K-Index lower limit of K-9 ball, gammas	No of years data used
1	Leningrad	600	3
2	Srednikan	750	11
3	Moscow	550	3
4	Yakutsk	550	8
5	Kazan'	550	11
6	Sverdlovsk	550	8
7	Irkutsk	350	8
8	Tbilisi	350	9
9	Tashkent	300	11

TABLE 70

AVERAGE ANNUAL VALUES OF THE K-INDEX FOR ALL DAYS AND THE CORRESPONDING VALUES OF THE THREE-HOUR AMPLITUDES OF THE MAGNETIC DISTURBANCES

Serial No	Observatory	K-index, average ball for the 1938-1948 period[1]	Average 3-hour amplitude, gammas
1	Leningrad	2.46	24
2	Srednikan	2.32	27
3	Moscow	2.59	22
4	Yakutsk	2.24	17
5	Kazan'	2.09	16
6	Sverdlovsk	2.39	19
7	Irkutsk	2.28	12
8	Tbilisi	2.68	16
9	Tashkent	2.64	14

1. The average indices for Tashkent, Kazan', and Srednikan were calculated for the 11-year period. The indices for the other observatories, calculated for a smaller number of years, was converted to allow for the same period.

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TABLE 71

ANNUAL COURSE OF GEOMAGNETIC ACTIVITY FOR 1938-1948. K-INDEX, SMOOTHED DEVIATIONS FROM THE AVERAGE ANNUAL VALUE BY MONTHS. ALL DAYS

Observatory	Months: Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Season: Winter	Equinox	Summer
Srednikan	−0.22	−0.07	0.13	0.13	0.03	−0.01	0.03	0.10	0.16	0.07	−0.13	−0.23	−0.16	0.12	0.04
Kazan'	0.00	0.11	0.17	0.01	−0.18	−0.23	−0.19	−0.07	0.13	0.18	0.05	−0.01	0.04	0.12	−0.17
Tashkent	−0.02	0.08	0.15	0.07	−0.06	−0.11	−0.08	0.01	0.03	0.04	−0.07	−0.08	−0.02	0.08	−0.06
Average	0.08	0.04	0.15	0.07	−0.07	−0.12	−0.08	0.01	0.12	0.10	−0.05	−0.11	−0.05	0.11	−0.06

TABLE 73

AVERAGE-MONTHLY VALUES OF 3-BALL CHARACTERISTICS AS PER DATA FROM THE FOLLOWING MAGNETIC OBSERVATORIES: VLADIVOSTOK, TASHKENT, TBILISI, IRKUTSK; SVERDLOVSK, KAZAN', YAKUTSK, SREDNIKAN, MOSCOW, AND LENINGRAD

Year	Month: Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Winter	Equinox	Summer	Year
1938	3.05	2.54	2.09	2.53	2.37	1.97	2.35	2.26	2.26	2.49	2.04	2.13	2.44	2.34	2.24	2.34
1939	1.62	2.36	2.74	2.86	2.72	2.36	2.42	2.15	2.14	2.63	1.60	1.97	1.89	2.59	2.41	2.30
1940	2.54	2.33	2.67	2.21	2.11	2.32	2.08	1.99	2.11	2.31	2.50	2.57	2.48	2.32	2.12	2.31
1941	2.44	2.85	3.17	2.35	2.43	2.33	2.42	2.45	2.64	2.06	2.47	2.10	2.46	2.56	2.41	2.48
1942	2.04	2.07	2.76	2.46	1.69	1.91	2.39	2.22	2.56	2.77	2.61	2.04	2.19	2.64	2.05	2.29
1943	2.15	2.06	2.34	2.19	2.36	2.23	2.53	3.19	3.02	2.96	2.89	2.50	2.40	2.63	2.58	2.54
1944	2.44	2.00	2.61	2.23	1.80	1.84	1.61	1.90	1.97	2.15	1.40	2.08	1.98	2.24	1.79	2.00
1945	1.73	1.89	2.28	1.91	1.93	1.58	1.74	1.68	2.05	2.20	1.81	2.12	1.89	2.11	1.73	1.91
1946	2.17	2.57	3.01	2.42	2.38	2.21	2.51	1.81	2.81	2.03	2.07	2.11	2.23	2.57	2.23	2.34
1947	2.27	2.15	3.14	2.52	2.55	2.86	2.63	3.12	3.35	2.96	2.35	2.33	2.28	2.99	2.79	2.69
1948	2.43	2.54	2.49	2.34	2.77	2.31	2.34	2.78	2.81	3.11	2.64	2.62	2.56	2.69	2.55	2.60
Average	2.26	2.41	2.66	2.37	2.28	2.17	2.27	2.32	2.52	2.52	2.22	2.23	2.25	2.52	2.26	2.35

TABLE 73

ANNUAL COURSE OF GEOMAGNETIC ACTIVITY FOR QUIET DAYS K-INDEX, SMOOTHED DEVIATIONS FROM AVERAGE BY MONTHS

Serial No	Observatory	Month Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Av ball for year
1	Leningrad	−0.38	−0.30	−0.09	0.03	0.14	0.28	0.34	0.33	0.15	−0.08	−0.17	−0.25	1.34
2	Srednikan	−0.34	−0.19	−0.02	0.06	0.14	0.18	0.15	0.19	0.21	0.06	−0.17	−0.32	1.22
3	Moscow	−0.20	0.02	0.13	0.09	0.15	0.23	0.18	0.04	−0.04	−0.09	−0.22	−0.29	1.66
4	Yakutsk	−0.19	−0.10	−0.01	0.11	0.14	0.03	0.08	0.24	0.17	−0.06	−0.21	−0.23	1.21
5	Kazan'	−0.05	0.02	0.01	−0.04	−0.02	0.00	−0.02	0.02	0.08	0.07	0.00	−0.06	0.87
6	Sverdlovsk	−0.24	−0.12	−0.02	0.02	0.10	0.14	0.14	0.18	0.16	0.02	−0.14	−0.24	1.37
7	Irkutsk	−0.23	−0.14	−0.07	0.02	0.14	0.23	0.25	0.25	0.15	−0.08	−0.25	−0.28	1.24
8	Tbilisi	−0.05	−0.04	−0.01	0.04	0.07	−0.02	−0.03	0.10	0.09	−0.02	−0.08	−0.07	1.84
9	Tashkent	0.00	0.07	0.05	0.03	0.00	−0.04	−0.04	0.00	0.04	0.01	−0.07	−0.08	1.77

Remark: Srednikan, Kazan' and Tashkent -- per data for 11 years, 1938-1948. Data from other observatories are for fewer years and are converted to the 11-year basis

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TABLE 74

ANNUAL COURSE OF GEOMAGNETIC ACTIVITY FOR DISTURBED DAYS K-INDEX, SMOOTHED DEVIATIONS FROM AVERAGE BY MONTHS

Serial No	Observatory	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Av ball for year
1	Leningrad	−0.51	−0.11	0.50	0.43	−0.01	−0.10	0.11	0.27	0.16	−0.04	−0.25	−0.44	3.91
2	Srednikan	−0.18	0.10	0.44	0.24	−0.19	−0.32	−0.17	0.05	0.20	0.13	−0.10	−0.20	3.78
3	Moscow	−0.22	0.13	0.38	0.17	−0.12	−0.15	−0.03	0.12	0.20	0.06	−0.23	−0.36	3.80
4	Yakutsk	−0.22	0.09	0.37	0.13	−0.28	−0.34	−0.08	0.20	0.32	0.18	−0.11	−0.26	3.51
5	Kazan'	−0.00	0.19	0.37	0.08	−0.33	−0.45	−0.29	−0.01	0.19	0.20	0.05	−0.01	3.54
6	Sverdlovsk	−0.22	0.01	0.26	0.07	−0.20	−0.23	−0.10	0.11	0.28	0.22	−0.01	−0.17	3.69
7	Irkutsk	−0.24	0.09	0.38	0.23	−0.06	−0.14	−0.02	0.12	0.19	0.04	−0.23	−0.34	3.60
8	Tbilisi	−0.21	−0.01	0.34	0.21	−0.12	−0.16	−0.01	0.11	0.14	0.03	−0.14	−0.18	3.80
9	Tashkent	−0.08	0.16	0.33	0.14	−0.17	−0.28	−0.17	0.05	0.16	0.08	−0.09	−0.16	3.83

Remark: Srednikan, Kazan' and Tashkent -- per data for 11 years, 1938-1948. Data from other observatories are for fewer years and are converted to the 11-year basis

TABLE 75

DAILY COURSE OF GEOMAGNETIC ACTIVITY, REDUCED TO 1938-1948 SREDNIKAN

ALL DAYS. K-INDEX, DEVIATION FROM AVERAGE DAILY

Month	World Time 0	3	6	9	12	15	18	21	24
Jan	−0.41	−0.47	−0.41	0.17	0.61	0.48	0.13	−0.11	
Feb	−0.36	−0.44	−0.38	0.29	0.67	0.35	−0.01	−0.08	
Mar	−0.29	−0.32	−0.12	0.23	0.38	0.22	−0.07	−0.02	
Apr	−0.14	0.01	0.20	0.19	0.11	−0.07	−0.21	−0.11	
May	−0.06	0.24	0.34	0.12	−0.10	−0.28	−0.30	0.00	
Jun	−0.07	0.15	0.48	0.23	−0.22	−0.28	−0.28	0.00	
Jul	−0.01	0.19	0.41	0.18	−0.15	−0.37	−0.27	−0.02	
Aug	−0.05	0.03	0.26	0.17	−0.03	−0.22	−0.17	−0.02	
Sep	0.14	−0.03	−0.07	0.22	0.14	0.01	−0.07	−0.08	
Oct	−0.23	−0.10	−0.07	0.15	0.36	0.18	−0.08	−0.21	
Nov	−0.36	−0.39	−0.21	0.30	0.49	0.27	0.01	−0.11	
Dec	−0.49	−0.50	−0.22	0.24	0.63	0.43	0.02	−0.15	
Winter	−0.41	−0.45	−0.31	0.25	0.60	0.38	0.03	−0.11	
Equinox	−0.20	−0.11	−0.02	0.20	0.25	0.08	−0.11	−0.10	
Summer	−0.05	0.15	0.37	0.17	−0.13	−0.29	−0.25	−0.01	
Year	−0.21	−0.13	0.02	0.21	0.24	0.06	−0.11	−0.07	

TABLE 76

DAILY COURSE OF GEOMAGNETIC ACTIVITY, REDUCED TO 1938-1948 SREDNIKAN

QUIET DAYS K-INDEX, SMOOTHED DEVIATIONS FROM DAILY AVERAGE

Month	World time 0	3	6	9	12	15	18	21	24
Jan	−0.06	−0.10	−0.23	0.04	0.40	0.18	−0.18	−0.04	
Feb	0.00	−0.05	−0.21	0.01	0.38	0.06	−0.18	0.01	
Mar	0.06	0.13	0.00	−0.06	0.18	−0.12	−0.19	0.00	
Apr	0.07	0.26	0.22	−0.08	−0.04	−0.22	−0.27	0.04	
May	0.12	0.26	0.35	−0.03	−0.16	−0.34	−0.34	0.12	
Jun	0.18	0.25	0.37	−0.02	−0.22	−0.40	−0.32	0.16	
Jul	0.24	0.28	0.33	−0.10	−0.25	−0.41	−0.27	0.17	
Aug	0.30	0.32	0.23	−0.15	−0.23	−0.37	−0.27	0.14	
Sep	0.34	0.34	0.07	−0.17	−0.11	−0.25	−0.30	0.06	
Oct	0.30	0.26	−0.03	−0.15	0.01	−0.16	−0.26	0.02	
Nov	0.16	0.06	−0.07	−0.05	0.16	−0.04	−0.19	−0.02	
Dec	0.01	−0.07	−0.13	0.04	0.32	0.11	−0.18	−0.09	
Winter	0.03	−0.04	−0.16	0.01	0.31	0.08	−0.18	−0.04	
Equinox	0.19	0.25	0.07	−0.11	0.01	−0.19	−0.25	0.03	
Summer	0.21	0.28	0.32	−0.07	−0.21	−0.38	−0.30	0.15	
Year	0.14	0.16	0.08	−0.06	0.04	−0.16	−0.25	0.05	

TABLE 77

DAILY COURSE OF GEOMAGNETIC ACTIVITY, REDUCED TO 1938-1948 SREDNIKAN

DISTURBED DAYS. K-INDEX, SMOOTHED DEVIATIONS FROM DAILY AVERAGE

Month	World time 0	3	6	9	12	15	18	21	24
Jan		−0.85	−0.92	−0.52	0.38	0.92	0.89	0.48	−0.36
Feb		−0.76	−0.88	−0.50	0.52	0.89	.72	0.34	−0.32
Mar		−0.71	−0.75	−0.15	0.62	0.69	0.50	0.16	0.36
Apr		−0.59	−0.39	0.31	0.58	0.32	0.18	−0.01	−0.38
May		−0.40	−0.05	0.53	0.43	0.07	−0.07	−0.16	−0.33
Jun		−0.29	0.07	0.49	0.33	−0.01	−0.14	−0.13	−0.30
Jul		−0.32	0.00	0.30	0.32	0.12	−0.11	−0.06	−0.25
Aug		−0.43	−0.18	0.09	0.36	0.35	0.08	−0.01	−0.22
Sep		−0.52	−0.38	−0.09	0.37	0.51	0.36	0.06	−0.31
Oct		−0.65	−0.64	−0.23	0.45	0.67	0.55	0.20	−0.36
Nov		−0.92	−0.90	−0.32	0.56	0.92	0.73	0.27	−0.36
Dec		−0.99	−0.97	−0.39	0.45	0.99	0.91	0.39	−0.38
Winter		−0.88	−0.92	−0.43	0.48	0.93	0.81	0.37	−0.36
Equinox		−0.62	−0.54	−0.04	0.50	0.55	0.40	0.10	0.35
Summer		−0.36	−0.04	0.35	0.36	0.13	−0.06	−0.10	−0.28
Year		−0.62	−0.50	−0.04	0.45	0.54	0.38	0.12	−0.33

TABLE 78

DAILY COURSE OF GEOMAGNETIC ACTIVITY, REDUCED TO 1938-1948 YAKUTSK.

QUIET DAYS. K-INDEX, SMOOTHED DEVIATIONS FROM DAILY AVERAGE

Month	World time 0	3	6	9	12	15	18	21	24
Jan		−0.23	0.09	−0.08	−0.05	0.18	0.24	0.01	−0.17
Feb		−0.23	0.20	0.02	−0.01	0.12	0.03	−0.04	−0.13
Mar		−0.16	0.13	0.17	0.04	0.07	0.0J	0.10	−0.13
Apr		0.04	0.14	0.27	0.01	−0.04	−0.08	−0.23	−0.07
May		0.24	0.19	0.34	−0.07	−0.12	−0.25	−0.30	0.01
Jun		0.20	0.19	0.32	−0.05	−0.10	−0.32	−0.27	0.06
Jul		0.04	0.24	0.34	0.02	−0.07	−0.28	−0.28	−0.03
Aug		0.02	0.31	0.42	0.03	−0.15	−0.19	−0.27	−0.18
Sep		0.01	0.23	0.29	−0.01	−0.19	−0.01	−0.16	−0.18
Oct		−0.08	0.14	0.11	−0.01	−0.01	0.11	−0.09	−0.17
Nov		−0.07	0.08	0.00	0.02	0.20	0.15	−0.08	−0.31
Dec		−0.14	0.00	0.05	−0.01	0.26	0.25	0.00	−0.32
Winter		−0.17	0.09	−0.03	−0.01	0.19	0.18	−0.03	−0.23
Equinox		−0.05	0.16	0.21	0.01	−0.04	0.00	−0.14	−0.14
Summer		0.12	0.23	0.36	−0.02	−0.11	−0.26	−0.28	−0.04
Year		−0.03	0.16	0.18	−0.01	0.01	−0.02	−0.15	−0.14

TABLE 79

DAILY COURSE OF GEOMAGNETIC ACTIVITY. REDUCED TO 1938-1948 YAKUTSK.

DISTURBED DAYS. K-INDEX, SMOOTHED DEVIATIONS FROM DAILY AVERAGE

Month	World time 0	3	6	9	12	15	18	21	24
Jan	−0.78	−0.90	−0.57	0.19	0.77	0.96	0.50	−0.16	
Feb	−0.59	−0.85	−0.54	0.31	0.76	0.79	0.36	−0.24	
Mar	−0.47	−0.76	−0.32	0.40	0.69	0.67	0.15	−0.36	
Apr	−0.34	−0.47	0.13	0.42	0.37	0.40	−0.11	−0.40	
May	−0.21	−0.16	0.44	0.33	0.16	0.09	−0.27	−0.38	
Jun	−0.19	−0.10	0.46	0.26	0.12	−0.01	−0.20	−0.34	
Jul	−0.23	−0.14	0.35	0.26	0.17	0.02	−0.09	−0.33	
Aug	−0.34	−0.25	0.23	0.29	0.33	0.12	0.02	−0.38	
Sep	−0.46	−0.47	−0.02	0.30	0.48	0.26	0.24	−0.35	
Oct	−0.47	−0.70	−0.31	0.38	0.64	0.41	0.37	−0.30	
Nov	−0.68	−0.93	−0.50	0.34	0.89	0.72	0.43	−0.29	
Dec	−0.86	−0.99	−0.58	0.18	0.94	1.02	0.52	−0.24	
Winter	−0.73	−0.92	−0.55	0.26	0.84	0.87	0.45	−0.23	
Equinox	−0.44	−0.60	−0.13	0.38	0.54	0.44	0.16	−0.35	
Summer	−0.24	−0.16	0.37	0.28	0.20	0.06	−0.14	−0.36	
Year	−0.47	−0.56	−0.10	0.30	0.53	0.45	0.16	−0.31	

TABLE 80

DAILY COURSE OF GEOMAGNETIC ACTIVITY. REDUCED TO 1938-1948 LENINGRAD.

QUIET DAYS. K-INDEX, SMOOTHED DEVIATIONS FROM DAILY AVERAGE

Month	World time 0	3	6	9	12	15	18	21	24
Jan	−0.30	−0.36	−0.11	−0.04	0.10	0.09	0.45	0.16	
Feb	−0.22	−0.22	−0.01	0.03	0.05	0.11	0.23	0.02	
Mar	−0.23	−0.11	0.06	0.17	0.20	0.08	−0.08	−0.09	
Apr	−0.40	−0.08	0.01	0.31	0.51	0.24	−0.34	−0.23	
May	−0.45	0.07	−0.12	0.38	0.68	0.20	−0.45	−0.33	
Jun	−0.40	0.18	−0.14	0.40	0.59	0.08	−0.27	−0.40	
Jul	−0.41	−0.02	0.03	0.33	0.50	0.19	−0.08	−0.53	
Aug	−0.44	−0.12	0.24	0.30	0.45	0.15	−0.06	−0.51	
Sep	−0.42	−0.09	0.22	0.41	0.33	0.04	−0.05	−0.43	
Oct	−0.38	−0.28	0.18	0.43	0.27	0.04	0.00	−0.24	
Nov	−0.21	−0.48	0.12	0.26	0.15	−0.01	0.14	0.03	
Dec	−0.18	−0.45	−0.05	0.03	0.08	−0.02	0.39	0.18	
Winter	−0.23	−0.38	−0.01	0.07	0.10	0.04	0.30	0.10	
Equinox	−0.36	−0.14	0.12	0.33	0.33	0.10	−0.12	−0.25	
Summer	−0.42	0.03	0.00	0.35	0.55	0.15	−0.22	−0.44	
Year	−0.34	−0.16	0.04	0.25	0.33	0.10	−0.01	−0.20	

TABLE 81

DAILY COURSE OF GEOMAGNETIC ACTIVITY, REDUCED TO 1938-1948 LENINGRAD.

DISTURBED DAYS. K-INDEX, SMOOTHED DEVIATIONS FROM DAILY AVERAGE

Month	World time 0	3	6	9	12	15	18	21	24
Jan	—0.28	—0.57	—0.73	—0.56	0.30	0.87	0.89	0.07	
Feb	—0.02	—0.70	—0.88	—0.55	0.22	0.81	0.72	0.37	
Mar	0.15	—0.80	—0.78	—0.30	0.15	0.74	0.47	0.38	
Apr	0.08	—0.63	—0.47	—0.09	0.23	0.46	0.30	0.15	
May	—0.06	—0.33	—0.37	0.08	0.37	0.27	0.03	—0.03	
Jun	—0.15	—0.22	—0.36	0.32	0.39	0.36	—0.15	—0.17	
Jul	—0.13	—0.36	—0.40	0.26	0.41	0.34	—0.01	—0.09	
Aug	0.07	—0.56	—0.57	—0.01	0.44	0.29	0.24	0.12	
Sep	0.15	—0.65	—0.58	0.26	0.23	0.40	0.46	0.25	
Oct	0.02	—0.73	—0.52	—0.41	0.07	0.48	0.66	0.40	
Nov	—0.20	—0.72	—0.55	—0.51	0.22	0.68	0.70	0.38	
Dec	—0.33	—0.62	0.61	—0.54	0.35	0.90	0.78	0.06	
Winter	—0.21	—0.65	0.69	—0.54	0.27	0.82	0.77	0.22	
Equinox	0.10	—0.70	—0.59	—0.26	0.17	0.52	0.47	0.29	
Summer	—0.07	—0.37	—0.43	0.16	0.40	0.32	0.03	—0.04	
Year	—0.06	—0.57	—0.57	—0.21	0.28	0.55	0.42	0.16	

TABLE 82

DAILY COURSE OF GEOMAGNETIC ACTIVITY, REDUCED TO 1938-1948. SVERDLOVSK

QUIET DAYS. K-INDEX, SMOOTHED DEVIATIONS FROM DAILY AVERAGE

Month	World time 0	3	6	9	12	15	18	21	24
Jan	—0.30	—0.15	0.03	0.09	—0.02	0.06	0.24	0.05	
Feb	—0.37	—0.04	0.10	0.16	0.02	0.00	0.19	—0.06	
Mar	—0.30	0.11	0.29	0.22	0.06	—0.10	—0.03	—0.21	
Apr	—0.12	0.12	0.32	0.27	0.10	—0.18	—0.22	—0.25	
May	—0.09	0.16	0.31	0.30	0.17	—0.25	—0.35	—0.23	
Jun	—0.21	0.22	0.29	0.34	0.22	—0.25	—0.39	—0.21	
Jul	—0.29	0.21	0.25	0.33	0.25	—0.18	—0.33	—0.23	
Aug	—0.36	0.17	0.32	0.24	0.21	—0.07	—0.29	—0.22	
Sep	—0.30	0.15	0.37	0.08	0.13	0.07	—0.20	—0.29	
Oct	—0.17	0.15	0.31	0.04	0.02	0.08	—0.07	—0.35	
Nov	—0.13	0.09	0.27	0.07	—0.05	—0.01	—0.01	—0.20	
Dec	—0.21	—0.01	0.18	0.04	—0.05	0.01	0.10	—0.02	
Winter	—0.25	—0.04	0.14	0.09	—0.02	0.02	0.13	—0.06	
Equinox	—0.22	0.13	0.32	0.15	0.08	—0.03	—0.13	—0.28	
Summer	—0.24	0.19	0.29	0.30	0.21	—0.19	—0.34	—0.22	
Year	—0.24	0.10	0.25	0.18	0.09	—0.07	—0.11	—0.19	

TABLE 83

DAILY COURSE OF GEOMAGNETIC ACTIVITY, REDUCED TO 1936-1948 SVERDLOVSK.

DISTURBED DAYS. K-INDEX, SMOOTHED DEVIATIONS FROM DAILY AVERAGE

Month	World time 0–3	3–6	6–9	9–12	12–15	15–18	18–21	21–24
Jan	—0.59	—0.82	—0.76	—0.31	0.57	1.01	0.71	0.22
Feb	—0.46	—0.69	—0.66	—0.26	0.45	0.79	0.70	0.13
Mar	—0.42	—0.50	—0.49	—0.05	0.35	0.52	0.52	0.08
Apr	—0.36	—0.34	—0.26	0.11	0.24	0.27	0.29	0.06
May	—0.26	—0.24	—0.08	0.22	0.22	0.19	0.05	—0.08
Jun	—0.35	—0.28	—0.03	0.28	0.33	0.28	0.01	—0.22
Jul	—0.43	—0.28	—0.15	0.21	0.44	0.29	0.15	—0.22
Aug	—0.37	—0.30	—0.36	0.16	0.44	0.31	0.24	—0.11
Sep	—0.34	—0.41	—0.54	0.05	0.36	0.46	0.39	—0.01
Oct	—0.37	—0.50	—0.62	—0.11	0.45	0.63	0.53	0.02
Nov	—0.54	—0.70	—0.72	—0.12	0.64	0.86	0.55	0.03
Dec	—0.64	—0.84	—0.80	—0.17	0.69	1.05	0.60	0.12
Winter	—0.56	—0.76	—0.74	—0.22	0.59	0.93	0.64	0.12
Equinox	—0.37	—0.44	—0.48	0.00	0.35	0.47	0.43	0.04
Summer	—0.35	—0.28	—0.16	0.22	0.36	0.27	0.11	—0.16
Year	—0.43	—0.49	—0.46	0.00	0.43	0.56	0.39	0.00

TABLE 84

DAILY COURSE OF GEOMAGNETIC ACTIVITY, REDUCED TO 1936-1948 KAZAN'.

ALL DAYS K-INDEX, DEVIATIONS FROM DAILY AVERAGE

Month	World time 0–3	3–6	6–9	9–12	12–15	15–18	18–21	21–24
Jan	—0.09	—0.66	—0.44	—0.28	0.01	0.51	0.50	0.42
Feb	—0.04	—0.48	—0.29	—0.17	0.01	0.35	0.49	0.20
Mar	—0.20	—0.53	—0.34	- 0.08	0.01	0.44	0.46	0.25
Apr	—0.09	—0.39	—0.28	0.01	0.04	0.30	0.20	0.20
May	0.07	—0.18	—0.33	—0.14	0.02	0.16	0.22	0.19
Jun	0.05	—0.19	—0.15	0.02	0.21	0.02	0.04	0.02
Jul	0.04	—0.25	—0.23	0.13	0.20	0.03	0.03	0.03
Aug	0.01	—0.32	—0.29	0.01	0 13	0.12	0.22	0.08
Sep	—0.16	—0.45	—0.33	—0.03	—0.01	0.33	0.38	0.25
Oct	—0.22	—0.53	-0.30	—0.22	0.07	0.41	0.50	0.29
Nov	—0.16	—0.59	—0.30	—0.18	0.10	0.46	0.40	0.26
Dec	—0.12	—0.60	—0.46	-0.21	0.16	0.55	0.43	0.27
Winter	—0.11	—0.59	—0.37	—0.21	0.07	0.47	0.45	0.29
Equinox	—0.17	—0.47	—0.31	—0.08	0.03	0.37	0.38	0.25
Summer	0.04	—0.23	—0.25	0.01	0.14	0.08	0.13	0.08
Year	—0.08	—0.43	—0.32	—0.10	0.07	0.30	0.32	0.20

TABLE 85

DAILY COURSE OF GEOMAGNETIC ACTIVITY, REDUCED TO 1938-1948 KAZAN'.

QUIET DAYS. K-INDEX, SMOOTHED DEVIATIONS FROM DAILY AVERAGE

Month	World time								
	0	3	6	9	12	15	18	21	24
Jan	0.05	—0.18	—0.03	0.02	—0.14	—0.03	0.16	0.12	
Feb	0.06	—0.12	0.00	0.04	—0.18	—0.05	0.19	0.06	
Mar	0.01	—0.08	0.03	0.13	—0.12	—0.[illegible]	0.07	—0.01	
Apr	—0.02	—0.10	—0.04	0.14	—0.03	0.07	—0.01	—0.02	
May	0.07	—0.09	—0.09	0.08	0.06	0.01	—0.02	—0.02	
Jun	0.17	—0.04	—0.06	0.04	0.09	—0.08	—0.07	—0.04	
Jul	0.17	—0.01	—0.08	0.04	0.04	—0.07	—0.09	—0.02	
Aug	0.09	—0.10	—0.13	0.04	—0.02	0.02	0.04	0.04	
Sep	0.05	—0.19	—0.07	0.05	—0.08	0.06	0.15	0.01	
Oct	0.10	—0.20	0.06	0.02	—0.13	0.02	0.12	—0.01	
Nov	0.14	—0.22	0.06	0.00	—0.13	0.00	0.10	0.03	
Dec	0.10	—0.20	0.00	0.02	—0.10	—0.01	0.09	0.07	
Winter	0.09	—0.18	0.01	0.02	—0.14	—0.02	0.14	0.07	
Equinox	0.04	—0.14	0.00	0.08	—0.09	0.03	0.08	—0.01	
Summer	0.12	—0.06	—0.09	0.05	0.04	—0.03	0.03	—0.01	
Year	0.08	—0.13	—0.03	0.05	—0.06	0.01	0.06	0.02	

TABLE 86

DAILY COURSE OF GEOMAGNETIC ACTIVITY, REDUCED TO 1938-1948 KAZAN'.

DISTURBED DAYS. K-INDEX, SMOOTHED DEVIATIONS FROM DAILY AVERAGE

Month	World time								
	0	3	6	9	12	15	18	21	24
Jan	—0.32	—0.98	—0.80	—0.39	0.36	0.96	0.86	0.30	
Feb	—0.26	—0.85	—0.68	—0.34	0.34	0.74	0.78	0.27	
Mar	—0.30	—0.73	—0.50	—0.19	0.26	0.58	0.60	0.28	
Apr	—0.32	—0.59	—0.34	—0.09	0.11	0.46	0.45	0.33	
May	—0.19	—0.43	—0.29	—0.03	0.11	0.33	0.24	0.24	
Jun	—0.15	—0.41	—0.29	0.06	0.24	0.30	0.18	0.04	
Jul	—0.16	—0.48	—0.36	0.06	0.37	0.30	0.28	—0.03	
Aug	—0.14	—0.58	—0.51	—0.08	0.43	0.40	0.41	0.06	
Sep	—0.21	—0.70	—0.59	—0.24	0.42	0.58	0.53	0.23	
Oct	—0.34	—0.85	—0.60	—0.34	0.42	0.75	0.60	0.34	
Nov	—0.43	—0.95	—0.70	—0.32	0.52	0.97	0.61	0.31	
Dec	—0.40	—1.02	—0.81	—0.33	0.48	1.08	0.73	0.28	
Winter	—0.35	—0.95	—0.75	—0.34	0.42	0.94	0.74	0.29	
Equinox	—0.29	—0.72	—0.51	—0.22	0.30	0.59	0.54	0.30	
Summer	—0.16	—0.48	—0.36	0.00	0.29	0.33	0.28	0.08	
Year	—0.27	—0.72	—0.54	—0.19	0.34	0.62	0.52	0.22	

TABLE 87

DAILY COURSE OF GEOMAGNETIC ACTIVITY, REDUCED TO 1938-1948, MOSCOW.

QUIET DAYS. K-INDEX, SMOOTHED DEVIATIONS FROM DAILY AVERAGE

World time: 0 3 6 9 12 15 18 21 24

Month								
Jan	-0.36	-0.01	0.16	0.07	-0.01	0.04	0.15	-0.03
Feb	-0.47	0.08	0.30	0.06	-0.02	0.09	0.18	-0.20
Mar	-0.52	0.13	0.29	0.05	0.11	0.23	0.06	-0.32
Apr	-0.22	-0.01	0.15	0.13	0.29	0.19	-0.17	-0.32
May	-0.14	0.01	0.19	0.25	0.22	0.04	-0.35	-0.25
Jun	-0.38	0.07	0.32	0.29	0.10	0.17	-0.35	-0.21
Jul	-0.42	-0.10	0.25	0.35	0.06	0.38	-0.24	-0.27
Aug	-0.43	-0.26	0.10	0.42	0.01	0.42	-0.05	-0.20
Sep	-0.44	-0.33	0.02	0.37	0.16	0.28	0.00	-0.05
Oct	-0.40	-0.36	0.03	0.31	0.32	0.08	0.01	0.02
Nov	-0.25	-0.22	-0.01	0.26	0.13	-0.01	0.05	0.06
Dec	-0.22	-0.03	0.02	0.15	-0.01	0.02	0.05	0.03
Winter	-0.33	-0.06	0.12	0.13	0.02	0.04	0.11	-0.04
Equinox	-0.40	-0.14	0.12	0.21	0.22	0.20	-0.03	-0.17
Summer	-0.34	-0.07	0.21	0.33	0.10	0.25	-0.25	-0.23
Year	-0.35	-0.09	0.15	0.23	0.11	0.16	-0.06	-0.15

TABLE 88

DAILY COURSE OF GEOMAGNETIC ACTIVITY, REDUCED TO 1938-1948, MOSCOW.

DISTURBED DAYS. K-INDEX, SMOOTHED DEVIATIONS FROM DAILY AVERAGE

World time: 0 3 6 9 12 15 18 21 24

Month								
Jan	-0.39	-0.76	-0.66	-0.31	0.34	0.86	0.74	0.17
Feb	-0.26	-0.76	-0.50	-0.30	0.22	0.71	0.72	0.17
Mar	-0.26	-0.60	-0.41	-0.20	0.13	0.41	0.63	0.31
Apr	-0.35	-0.38	-0.38	-0.05	0.24	0.13	0.49	0.30
May	-0.21	-0.25	-0.30	0.05	0.39	0.08	0.21	0.04
Jun	-0.10	-0.24	-0.14	0.00	0.46	0.19	0.03	-0.12
Jul	-0.16	-0.18	-0.18	-0.06	0.53	0.24	-0.11	-0.07
Aug	-0.07	-0.24	-0.40	-0.02	0.46	0.34	-0.04	0.01
Sep	-0.13	-0.52	-0.46	-0.06	0.32	0.56	0.24	0.05
Oct	-0.33	-0.68	-0.50	-0.16	0.36	0.62	0.52	0.15
Nov	-0.43	-0.79	-0.67	-0.18	0.45	0.70	0.61	0.31
Dec	-0.44	-0.83	-0.75	-0.21	0.42	0.85	0.66	0.28
Winter	-0.38	-0.78	-0.64	-0.25	0.36	0.78	0.68	0.23
Equinox	-0.27	-0.54	-0.44	-0.12	0.26	0.43	0.47	0.20
Summer	-0.14	-0.23	-0.26	-0.01	0.46	0.21	0.01	-0.04
Year	-0.26	-0.52	0.45	-0.12	0.36	0.47	0.39	0.13

POOR ORIGINAL

TABLE 89

DAILY COURSE OF GEOMAGNETIC ACTIVITY, REDUCED TO 1938-1948. IRKUTSK.

QUIET DAYS. K-INDEX, SMOOTHED DEVIATIONS FROM DAILY AVERAGE

Month	World time								
	0	3	6	9	12	15	18	21	24
Jan	−0.07	−0.02	0.15	0.01	0.13	0.16	−0.08	−0.24	
Feb	−0.11	0.07	0.08	0.04	0.08	0.10	0.04	−0.20	
Mar	−0.16	0.24	0.24	0.12	0.03	0.03	−0.14	−0.29	
Apr	−0.15	0.33	0.37	0.20	−0.01	−0.09	−0.29	−0.35	
May	−0.09	0.38	0.46	0.24	−0.07	−0.17	−0.40	−0.33	
Jun	−0.01	0.42	0.48	0.28	−0.14	−0.26	−0.45	−0.29	
Jul	0.04	0.38	0.52	0.23	−0.19	−0.31	−0.43	−0.26	
Aug	0.06	0.30	0.56	0.08	−0.21	−0.24	−0.34	−0.23	
Sep	0.03	0.20	−0.46	−0.04	−0.20	0.01	−0.22	−0.24	
Oct	0.00	0.07	0.39	−0.07	0.12	0.14	−0.12	0.26	
Nov	−0.01	0.01	0.42	0.01	−0.03	0.04	−0.13	−0.29	
Dec	−0.04	0.02	0.38	0.03	0.06	0.06	−0.16	−0.33	
Winter	−0.06	0.02	0.26	0.02	0.06	0.09	−0.10	−0.27	
Equinox	−0.07	0.21	0.36	0.05	−0.08	0.01	0.19	−0.28	
Summer	0.00	0.37	0.50	0.21	−0.15	−0.24	−0.40	−0.28	
Year	−0.04	0.20	0.38	0.09	−0.06	−0.05	−0.23	−0.28	

TABLE 90

DAILY COURSE OF GEOMAGNETIC ACTIVITY, REDUCED TO 1938-1948. IRKUTSK.

DISTURBED DAYS. K-INDEX, SMOOTHED DEVIATIONS FROM DAILY AVERAGE

Month	World time								
	0	3	6	9	12	15	18	21	24
Jan	−0.69	−0.66	−0.28	0.07	0.62	0.85	0.38	−0.26	
Feb	−0.52	−0.59	−0.32	0.07	0.57	0.70	0.35	−0.28	
Mar	−0.46	−0.41	−0.19	0.26	0.49	0.45	0.17	−0.28	
Apr	0.43	0.23	0.12	0.41	0.28	0.20	−0.01	−0.28	
May	−0.33	0.00	0.33	0.44	0.14	−0.02	−0.20	−0.33	
Jun	0.31	0.03	0.41	0.44	0.21	−0.10	−0.21	−0.44	
Jul	−0.34	−0.03	0.30	0.43	0.37	−0.08	−0.15	−0.48	
Aug	−0.36	0.08	0.07	0.37	0.16	0.01	−0.05	−0.40	
Sep	−0.41	−0.23	−0.08	0.28	0.49	0.19	0.07	−0.32	
Oct	−0.50	0.44	−0.16	0.32	0.59	0.40	0.11	−0.29	
Nov	−0.68	−0.63	−0.24	0.37	0.72	0.66	0.10	−0.33	
Dec	−0.78	−0.68	−0.25	0.25	0.72	0.84	0.21	−0.31	
Winter	−0.67	−0.64	−0.27	0.19	0.66	0.76	0.26	−0.30	
Equinox	−0.45	−0.34	−0.08	0.32	0.46	0.31	0.08	−0.29	
Summer	−0.34	−0.02	0.28	0.42	0.29	−0.05	−0.15	−0.41	
Year	−0.48	−0.33	−0.02	0.31	0.47	0.34	0.06	−0.33	

TABLE 91

DAILY COURSE OF GEOMAGNETIC ACTIVITY, REDUCED TO 1938-1948. TBILISI.

QUIET DAYS. K-INDEX, SMOOTHED DEVIATIONS FROM DAILY AVERAGE

Month	World time 0–3	3–6	6–9	9–12	12–15	15–18	18–21	21–24
Jan	—0.38	—0.12	0.29	0.15	0.18	0.00	—0.01	—0.08
Feb	—0.52	0.13	0.40	0.15	0.28	—0.05	—0.05	—0.08
Mar	—0.59	—0.01	0.47	0.16	0.29	—0.12	—0.15	—0.06
Apr	—0.46	0.21	0.49	0.15	0.22	—0.16	—0.23	—0.22
May	—0.35	0.42	0.48	0.11	0.19	—0.18	—0.27	—0.38
Jun	—0.44	0.49	0.43	0.23	0.21	—0.16	—0.33	—0.40
Jul	—0.52	0.43	0.41	0.40	0.18	—0.13	—0.33	—0.41
Aug	—0.50	0.35	0.43	0.38	0.06	—0.17	—0.21	—0.35
Sep	—0.44	0.27	0.37	0.26	0.06	—0.14	—0.12	—0.28
Oct	—0.37	0.16	0.27	0.21	0.09	—0.06	—0.05	—0.24
Nov	—0.30	0.07	0.27	0.17	0.01	—0.05	0.03	—0.18
Dec	—0.30	—0.02	0.28	0.12	0.04	—0.03	0.03	—0.10
Winter	—0.38	—0.05	0.31	0.15	0.13	—0.03	0.00	—0.11
Equinox	—0.46	0.16	0.40	0.20	0.16	—0.12	—0.14	—0.20
Summer	—0.45	0.42	0.44	0.28	0.16	—0.16	—0.29	—0.39
Year	—0.43	0.18	0.38	0.21	0.15	—0.10	—0.14	—0.23

TABLE 92

DAILY COURSE OF GEOMAGNETIC ACTIVITY, REDUCED TO 1938-1948. TBILISI.

DISTURBED DAYS K-INDEX, SMOOTHED DEVIATIONS FROM DAILY AVERAGE

Month	World time 0–3	3–6	6–9	9–12	12–15	15–18	18–21	21–24
Jan	—0.69	—0.65	—0.28	—0.09	0.34	0.66	0.69	0.02
Feb	—0.54	—0.62	—0.15	—0.10	0.21	0.49	0.62	0.05
Mar	—0.54	—0.53	—0.01	0.05	0.18	0.37	0.36	0.09
Apr	—0.63	—0.37	0.16	0.18	0.16	0.33	0.15	0.01
May	—0.63	—0.03	0.18	0.21	0.20	0.25	0.03	—0.20
Jun	—0.67	0.16	0.08	0.23	0.29	0.25	—0.01	—0.32
Jul	—0.63	0.11	—0.03	0.26	0.31	0.24	0.04	—0.30
Aug	—0.50	—0.06	—0.09	0.28	0.30	0.18	0.12	—0.23
Sep	—0.45	—0.23	—0.15	0.20	0.28	0.29	0.28	—0.21
Oct	—0.46	—0.38	—0.28	0.12	0.26	0.45	0.45	—0.18
Nov	—0.58	—0.55	—0.35	0.14	0.39	0.55	0.46	—0.07
Dec	—0.72	—0.64	—0.35	0.05	0.49	0.64	0.52	—0.02
Winter	—0.63	—0.61	—0.28	0.00	0.36	0.59	0.57	0.00
Equinox	—0.52	—0.38	—0.07	0.14	0.22	0.36	0.31	—0.07
Summer	—0.61	0.04	0.04	0.24	0.28	0.23	0.04	—0.26
Year	—0.59	—0.32	—0.11	0.13	0.28	0.39	0.31	—0.11

TABLE 93

DAILY COURSE OF GEOMAGNETIC ACTIVITY, REDUCED TO 1938-1948. TASHKENT.

ALL DAYS. K-INDEX, DEVIATIONS FROM DAILY AVERAGE

Month	World time 0–3	3–6	6–9	9–12	12–15	15–18	18–21	21–24
Jan	−0.40	−0.18	0.13	0.09	0.14	0.23	[illegible]	−0.24
Feb	−0.36	−0.13	0.11	0.27	0.12	[illegible]	0.09	−0.29
Mar	−0.39	0.02	0.16	0.28	0.02	0.02	0.01	0.18
Apr	−0.21	0.01	0.34	0.28	0.07	−0.02	−0.12	−0.38
May	−0.17	0.22	0.42	0.12	0.07	−0.12	−0.19	−0.25
Jun	−0.12	0.18	0.49	0.28	0.08	−0.22	−0.23	−0.16
Jul	−0.11	0.11	0.38	0.36	0.05	−0.16	−0.25	−0.47
Aug	−0.22	0.16	0.40	0.21	0.03	−0.06	−0.17	−0.38
Sep	−0.31	0.04	0.23	0.29	0.01	0.06	0.02	−0.33
Oct	−0.45	0.01	0.14	0.11	0.18	0.21	0.09	−0.32
Nov	−0.28	−0.17	0.12	0.06	0.15	0.23	0.15	−0.28
Dec	−0.38	−0.07	0.12	0.11	0.13	0.29	0.02	−0.26
Winter	−0.36	−0.13	0.12	0.13	0.13	0.21	0.10	−0.27
Equinox	−0.34	0.02	0.21	0.24	0.07	0.07	0.01	−0.31
Summer	−0.15	0.17	0.43	0.25	0.06	−0.13	−0.21	−0.39
Year	−0.28	0.02	0.25	0.20	0.09	0.06	−0.03	−0.32

TABLE 94

DAILY COURSE OF GEOMAGNETIC ACTIVITY, REDUCED TO 1938-1948. TASHKENT.

QUIET DAYS. K-INDEX, SMOOTHED DEVIATIONS FROM DAILY AVERAGE

Month	World time 0–3	3–6	6–9	9–12	12–15	15–18	18–21	21–24
Jan	−0.17	0.40	0.55	0.29	−0.09	−0.28	−0.28	−0.41
Feb	−0.19	0.36	0.52	0.35	−0.10	−0.29	−0.24	0.40
Mar	−0.08	0.38	0.51	0.31	−0.13	−0.32	−0.29	−0.42
Apr	0.06	0.41	0.60	0.30	−0.08	−0.40	−0.40	−0.49
May	0.07	0.44	0.60	0.28	0.05	0.48	−0.44	−0.49
Jun	0.02	0.40	0.61	0.34	0.08	−0.45	−0.45	−0.53
Jul	−0.02	0.38	0.67	0.36	0.00	−0.36	−0.48	−0.55
Aug	−0.06	0.41	0.64	0.32	−0.09	−0.33	−0.41	−0.48
Sep	−0.06	0.40	0.50	0.32	−0.14	0.26	−0.32	−0.44
Oct	−0.04	0.31	0.15	0.20	−0.19	−0.19	−0.23	−0.32
Nov	−0.04	0.29	0.13	0.10	−0.18	−0.15	0.21	−0.23
Dec	−0.10	0.35	0.48	0.18	−0.12	−0.19	−0.28	−0.32
Winter	0.12	0.35	0.49	0.23	−0.12	−0.23	−0.25	−0.31
Equinox	−0.03	0.39	0.52	0.29	−0.14	−0.29	−0.31	−0.42
Summer	0.00	0.44	0.63	0.32	0.01	−0.40	−0.45	−0.51
Year	−0.05	0.38	0.55	0.28	−0.08	−0.31	−0.31	−0.42

TABLE 95

DAILY COURSE OF GEOMAGNETIC ACTIVITY, REDUCED TO 1938-1948. TASHKENT.

DISTURBED DAYS. K-INDEX, SMOOTHED DEVIATIONS FROM DAILY AVERAGE

Month	World Time 0–3	3–6	6–9	9–12	12–15	15–18	18–21	21–24
Jan	−0.63	−0.56	−0.27	0.05	0.46	0.80	0.43	−0.27
Feb	−0.56	−0.49	−0.26	0.14	0.39	0.63	0.38	−0.24
Mar	−0.58	−0.33	−0.01	0.22	0.29	0.41	0.23	−0.22
Apr	−0.53	−0.22	0.28	0.22	0.20	0.23	0.07	−0.24
May	−0.37	−0.08	0.36	0.22	0.16	0.06	−0.07	−0.26
Jun	−0.27	−0.01	0.30	0.26	0.13	0.02	−0.07	−0.31
Jul	−0.30	−0.02	0.16	0.28	0.19	0.08	0.03	−0.40
Aug	−0.38	−0.06	0.02	0.24	0.30	0.16	0.12	−0.38
Sep	−0.42	−0.15	−0.04	0.18	0.34	0.33	0.18	−0.43
Oct	−0.47	−0.27	−0.09	0.19	0.40	0.48	0.20	−0.47
Nov	−0.60	−0.43	−0.14	0.24	0.50	0.64	0.21	−0.43
Dec	−0.68	−0.54	−0.19	0.15	0.52	0.78	0.31	−0.36
Winter	−0.62	−0.50	−0.22	0.14	0.47	0.71	0.33	−0.32
Equinox	−0.50	−0.24	0.04	0.20	0.31	0.36	0.17	−0.34
Summer	−0.33	−0.04	0.21	0.25	0.19	0.08	0.00	−0.35
Year	−0.48	−0.26	0.01	0.20	0.32	0.38	0.17	−0.34

TABLE 96

COEFFICIENTS FOR TRANSFORMING THE VALUES OF THE DECLINATION FROM

ANGULAR MINUTES INTO GAMMAS

Serial No	Observatories	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948
1	Srednikan	4.70	4.70	4.71	4.72	4.73	4.74	4.74	4.75	4.76	4.77	4.77
2	Leningrad	4.45	4.44	4.44	4.43							4.37
3	Sverdlovsk	4.69	4.69	4.68	4.68	4.67	4.67	4.66	4.66	4.65	4.65	4.64
4	Irkutsk	5.52	5.52	5.53	5.53	5.53	5.54	5.54	5.54	5.53	5.53	5.53
5	Yuzhno-Sakhalinsk	7.29	7.29	7.29	7.31	7.32	7.32	7.33	7.34	7.34	7.35	7.35
6	Tashkent	7.38	7.39	7.40	7.40	7.41	7.42	7.42	7.43	7.43	7.44	7.45

TABLE 97

NUMBER (N) OF MAGNETIC STORMS IN DIFFERENT YEARS AND AVERAGE

ANNUAL RELATIVE NUMBER (W) OF SUNSPOTS

1878	1879	1880	1881	1882	1883	1884	1885	1886	1887	1888	1889	1890	1891	1892
6	3	10	13	24	21	12	22	20	[illegible]	11	6	3	18	31
3	6	32	54	60	64	64	52	25	[illegible]	7	6	7	36	73
1893	1894	1895	1896	1897	1898	1899	1900	1901	1902	1903	1904	1905	1906	1907
17	23	19	24	10	16	9	6	2	2	8	10	13	11	19
85	78	64	42	26	27	12	10	3	5	24	42	64	54	62
1908	1909	1910	1911	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922
21	19	25	16	3	3	7	15	24	30	31	35	31	17	23
48	44	19	6	4	1	10	47	57	101	81	64	38	26	14
1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934	1935	1936	1937
7	9	17	28	25	23	25	28	14	17	12	11	15	17	38
6	17	44	64	69	78	65	36	21	11	6	9	36	80	114
1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948	1949	1950	1951	
41	37	31	23	21	34	16	21	29	29	35	25	28	36	
110	89	68	48	27	15	11	36	92	152	136	135	84	68	

TABLE 98

NUMBER OF STORMS OF THE 3 CATEGORIES BY YEARS, EXPRESSED AS A PERCENTAGE OF THE TOTAL NUMBER OF STORMS OF A GIVEN CATEGORY, FOR 1938-1948

	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948
Moderate storms	10.6	10.1	7.7	4.8	6.3	14.5	6.3	8.7	9.7	8.7	12.6
Intense storms	17.3	14.7	14.7	9.3	9.3	5.3	1.3	4.0	2.7	10.7	10.7
Very intense storms	17.1	14.3	11.4	17.1	2.9	0.0	5.7	0.0	20.0	8.6	2.9
All categories	12.9	11.7	9.8	7.3	6.6	10.9	5.0	6.6	9.1	9.1	11.0

TABLE 99

NUMBER OF STORMS WITH SUDDEN BEGINNING, BY YEARS, EXPRESSED AS A PERCENTAGE OF THE TOTAL NUMBER OF STORMS FOR 1938-1948

	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948
Moderate storms	23.4	8.5	2.1	2.1	6.4	0.0	4.3	8.5	17.0	12.8	14.9
Intense storms	20.0	16.0	28.0	4.0	4.0	0.0	0.0	0.0	4.0	16.0	8.0
Very intense storms	16.7	16.7	12.5	16.7	0.0	0.0	4.1	0.0	20.8	12.5	0.0
All categories	20.8	12.5	11.5	6.2	4.2	0.0	3.1	4.2	14.6	15.5	9.4

TABLE 100

ANNUAL COURSE OF THE NUMBER OF STORMS

(PERCENTAGE: 100% REPRESENTS TOTAL FOR YEAR)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Moderate storms	8.2	8.7	10.1	8.7	9.2	6.8	7.7	9.2	6.3	6.8	8.2	10.1
Intense storms	[illegible]	[illegible]	14.7	8.0	5.3	2.7	6.7	9.3	16.0	13.3	8.0	4.0
Very intense storms	14.3	8.6	17.1	20.0	2.9	2.9	5.7	5.7	11.4	5.7	0.0	5.7
All storms	8.2	8.2	12.0	9.8	7.6	5.4	7.2	8.8	9.2	8.2	7.2	8.2

TABLE 101

ANNUAL COURSE OF NUMBER OF STORMS WITH SUDDEN BEGINNING

(PERCENTAGE: 100% REPRESENTS TOTAL FOR YEAR)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Moderate storms	4.2	10.6	2.1	15.0	8.5	12.8	15.0	10.6	8.5	2.1	2.1	8.5
Intense storms	0.0	4.0	8.0	1.0	12.0	4.0	20.0	4.0	24.0	16.0	0.0	4.0
Very intense storms	12.5	0.0	16.7	20.8	4.2	4.2	8.3	8.3	12.5	4.2	0.0	8.3
All storms	5.2	6.3	7.3	13.5	8.3	8.3	14.6	8.3	13.5	6.3	1.0	7.3

TABLE 102

DAILY COURSE OF STORMS DURING VARIOUS SEASONS OF YEAR

(PERCENTAGE: 100% REPRESENTS TOTAL FOR 24 HOURS)

World time	0	1	2	3	4	5	6	7	8	9	10	11
Winter	1.0	2.0	4.0	3.0	3.0	2.0	5.9	5.0	9.9	5.9	6.9	9.9
Equinox	6.4	1.6	4.0	4.0	6.4	6.4	8.8	6.4	4.8	1.6	3.2	2.4
Summer	4.4	6.6	1.1	9.9	4.4	2.2	1.4	4.4	5.5	4.4	6.6	0.0
Year	4.1	3.2	3.2	5.4	4.7	3.8	6.6	5.4	6.6	3.8	5.4	4.1

World time	12	13	14	15	16	17	18	19	20	21	22	23
Winter	5.9	5.9	5.0	6.9	1.0	3.0	2.0	1.0	3.0	4.0	4.0	0.0
Equinox	6.4	3.2	3.2	4.8	3.2	5.6	3.2	3.2	0.0	3.2	4.0	4.0
Summer	3.3	3.3	2.2	1.1	3.3	4.4	4.4	3.3	3.3	5.5	5.5	6.6
Year	5.4	4.1	3.5	4.4	2.5	4.4	3.2	2.5	1.9	4.1	4.4	3.5

POOR ORIGINAL

TABLE 103

DAILY COURSE OF NUMBER OF BEGINNINGS OF STORMS OF VARIOUS CATEGORIES

(PERCENTAGE: 100% REPRESENTS TOTAL FOR 24 HOURS)

World time	0	1	2	3	4	5	6	7	8	9	10	11
Moderate storms	3.4	3.4	2.4	5.8	4.3	4.8	5.3	5.8	6.3	5.8	4.8	3.9
Intense storms	4.0	2.7	6.7	5.3	5.3	2.7	6.7	4.0	5.3	2.7	10.7	4.0
Very intense storms	2.9	5.7	0.0	5.7	11.4	2.9	8.6	8.6	2.9	0.0	0.0	2.9
All storms	3.5	3.5	3.2	5.7	5.4	4.1	6.0	5.7	5.7	4.4	5.7	3.8

World time	12	13	14	15	16	17	18	19	20	21	22	23
Moderate storms	5.3	5.3	2.9	4.8	1.0	5.3	1.9	2.5	2.5	3.9	5.8	2.9
Intense storms	4.0	2.7	4.0	2.7	5.3	2.7	5.3	0.0	1.3	4.0	4.0	4.0
Very intense storms	11.4	2.9	0.0	5.7	5.7	2.9	5.7	5.7	0.0	5.7	2.9	0.0
All storms	5.7	4.4	2.8	4.4	2.5	1.4	3.2	2.2	1.9	4.1	5.0	2.8

TABLE 104

DAILY COURSE OF NUMBER OF SUDDEN BEGINNINGS OF STORMS OF VARIOUS CATEGORIES (PERCENTAGE: 100% REPRESENTS TOTAL FOR 24 HOURS)

World time	0	1	2	3	4	5	6	7	8	9	10	11
Moderate storms	0.0	2.1	2.1	10.6	6.4	4.3	2.1	4.3	2.1	6.4	4.3	4.3
Intense storms	8.0	0.0	8.0	12.0	4.0	0.0	8.0	8.0	8.0	0.0	8.0	0.0
Very intense storms	0.0	8.3	0.0	8.3	12.5	4.2	12.5	4.2	0.0	0.0	0.0	0.0
All storms	2.1	3.1	3.1	10.4	7.3	3.1	6.2	5.2	3.1	3.1	4.2	2.1

World time	12	13	14	15	16	17	18	19	20	21	22	23
Moderate storms	8.5	2.1	2.1	0.0	0.0	2.1	6.4	2.1	4.3	6.4	14.9	2.1
Intense storms	0.0	0.0	4.0	0.0	0.0	4.0	8.0	0.0	0.0	4.0	12.0	4.0
Very intense storms	8.3	0.0	0.0	4.2	4.2	4.2	12.5	8.3	0.0	8.3	0.0	0.0
All storms	6.2	1.0	2.1	1.0	1.0	3.1	8.3	3.1	2.1	6.2	10.4	2.1

TABLE 105

DAILY COURSE OF BEGINNINGS OF ACTIVE PERIODS

(PERCENTAGE: 100% REPRESENTS 24 HOURS)

World time	0	1	2	3	4	5	6	7	8	9	10	11
Leningrad	1.9	1.9	1.9	1.3	1.3	0.6	1.9	0.0	0.6	3.2	3.2	11.4
Srednikan	0.8	0.8	0.3	2.8	4.2	4.2	9.2	7.2	6.4	5.3	10.8	9.2
Sverdlovsk	5.6	0.0	3.2	0.7	3.4	1.1	0.7	5.4	4.4	5.6	12.7	2.0
Irkutsk	0.4	1.5	2.2	0.7	1.9	2.2	3.4	6.0	4.5	11.2	10.4	8.2
Yuzhno-Sakhalinsk	0.9	3.0	3.9	4.8	3.9	9.2	7.8	6.6	7.8	9.0	10.4	4.8
Tashkent	1.7	1.9	1.7	1.9	5.1	1.5	7.0	5.8	4.9	7.0	9.6	7.0

World time	12	13	14	15	16	17	18	19	20	21	22	23
Leningrad	6.3	7.6	7.0	6.3	8.2	4.4	10.8	7.0	5.7	3.8	1.9	1.9
Srednikan	7.8	6.9	4.2	3.1	3.6	3.3	3.3	1.4	1.7	1.1	1.1	1.4
Sverdlovsk	16.6	2.9	9.0	3.2	7.6	2.7	2.7	2.9	3.2	1.2	2.7	0.2
Irkutsk	[illegible]	6.7	6.3	7.1	1.9	3.7	3.4	1.9	1.5	1.9	3.0	1.1
Yuzhno-Sakhalinsk	8.4	4.5	2.7	3.6	1.5	1.8	2.1	0.3	0.6	0.9	0.9	0.9
Tashkent	8.5	4.0	5.6	4.3	3.1	4.3	4.1	2.1	1.1	1.3	1.7	1.5

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TABLE 106

AVERAGE ANNUAL AMPLITUDES OF STORMS

Observatory	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948
Moderate storms declination											
Leningrad	43	35	38	39	—	—	—	—	—	44	42
Srednikan	44	37	41	48	37	49	50	46	43	49	55
Sverdlovsk	26	27	25	27	29	28	32	32	29	34	24
Irkutsk	19	20	20	25	22	20	26	23	23	25	22
Yuzhno-Sakhalinsk	11	6	7	12	11	11	12	8	10	15	13
Tashkent	13	12	12	13	12	11	13	12	12	18	15
Horizontal component											
Leningrad	201	179	166	176	—	—	—	—	—	241	209
Srednikan	238	211	185	232	193	192	235	240	277	360	212
Sverdlovsk	161	146	112	162	129	133	129	113	133	145	111
Irkutsk	122	126	106	132	132	134	152	121	147	149	135
Yuzhno-Sakhalinsk	81	77	66	75	93	91	105	63	86	122	110
Tashkent	119	87	98	99	129	109	122	106	124	133	126
Vertical component											
Leningrad	212	174	176	178	—	—	—	—	—	226	220
Srednikan	—	—	—	—	—	155	194	181	235	290	176
Sverdlovsk	87	75	84	94	74	64	80	60	73	87	68
Irkutsk	45	45	40	46	56	44	43	39	52	55	51
Yuzhno-Sakhalinsk	10	17	7	16	10	12	7	11	12	22	24
Tashkent	38	35	34	40	41	29	31	27	40	42	39
Intense storms declination											
Leningrad	68	56	72	64	—	—	—	—	—	82	65
Srednikan	52	57	50	54	60	78	111	85	64	85	109
Sverdlovsk	39	42	43	37	36	48	38	46	74	45	44
Irkutsk	26	29	26	28	27	29	30	27	46	36	28
Yuzhno-Sakhalinsk	10	13	12	15	14	22	24	16	13	21	17
Tashkent	15	15	15	14	12	18	13	16	17	19	18
Horizontal component											
Leningrad	316	418	385	330	—	—	—	—	—	529	476
Srednikan	323	382	340	368	398	394	332	472	159	407	680
Sverdlovsk	195	181	223	225	181	215	172	158	301	229	171
Irkutsk	191	190	196	157	155	172	224	174	216	277	189
Yuzhno-Skhalinsk	114	127	122	114	119	133	245	101	125	212	149
Tashkent	132	144	132	136	145	133	184	149	205	202	167
Vertical component											
Leningrad	330	369	328	294	—	—	—	—	—	384	392
Srednikan	—	—	—	—	—	396	262	366	410	381	621
Sverdlovsk	133	154	141	149	145	174	152	90	344	161	211
Irkutsk	56	83	67	55	60	79	134	64	112	98	101
Yuzhno-Sakhalinsk	9	20	17	13	9	28	43	10	8	44	31
Tashkent	47	52	39	39	35	44	50	45	48	63	47
Very intense storms declination											
Leningrad	148	128	212	137	—	—	—	—	—	140	125
Srednikan	56	64	66	66	126	—	80	—	104	87	176
Sverdlovsk	67	73	106	196	80	—	90	—	123	82	58
Irkutsk	64	49	64	37	68	—	49	—	77	46	70
Yuzhno-Skhalinsk	30	33	18	44	34	—	25	—	36	32	30
Tashkent	31	23	33	39	30	—	35	-	36	28	41

	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948
Horizontal component											
Leningrad	937	1064	1183	1134	—	—	—	—		734	480
Srednikan	446	494	514	562	1004	—	644	—	645	763	784
Sverdlovsk	418	320	656	739	442	—	304	—	680	497	327
Irkutsk	419	281	368	548	242	—	288	—	497	354	253
Yuzhno-Sakhalinsk	283	201	200	325	184	—	319	—	271	249	238
Tashkent	230	273	296	340	186	—	277	—	223	232	310
Vertical component											
Leningrad	593	704	433	501	—	—	—	—	—	663	69[illegible]
Srednikan	—	—	—	—	—	—	409	—	589	691	508
Sverdlovsk	388	347	596	687	174	—	397	—	561	469	258
Irkutsk	229	144	209	294	92	—	86	—	251	179	175
Yuzhno-Sakhalinsk	55	44	30	84	39	—	18	—	49	62	49
Tashkent	67	60	100	128	62	—	63		108	73	58

TABLE 107

NUMBER OF STORMS OF DIFFERENT AMPLITUDE

HORIZONTAL COMPONENT H, 1938-1948

Amplitudes in gammas	Srednikan	Leningrad	Sverdlovsk	Irkutsk	Yuzhno-Sakhalinsk	Tashkent
0—50	0	0	0	0	9	2
51—100	6	8	24	18	82	72
101—150	33	14	123	78	51	124
151—200	35	33	59	37	13	51
201—250	42	22	36	8	6	21
251—300	25	20	19	5	2	4
301—350	29	12	14	2	2	5
351—400	19	3	2	1	0	2
401—450	20	8	1	1	0	1
451—500	11	3	1	1	0	0
501—550	7	4	2	0	1	0
551—600	15	3	3	0	0	1
⩾601	17	27	10	3	1	1

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TABLE 108

NUMBER OF STORMY DAYS OF STORMS OF VARIOUS CATEGORIES DURING THE

0-110 DAYS FROM DAYS OF MODERATE STORMS

Days	0	1	2	3	4	5	6	7	8	9	10	11	12	13
Days without storm [1]		190	336	408	442	455	463	468	467	473	474	474	463	453
		389	410	432	447	453	464	481	473	454	445	449	456	451
		411	408	418	433	459	471	469	459	454	452	445	449	459
		390	395	408	433	443	446	448	435	427	433	442	438	445
Days of moderate storms [2]	659	464	308	227	186	162	148	138	134	126	122	120	124	128
		175	164	146	142	141	134	121	123	137	142	134	125	130
		159	154	144	131	116	112	117	114	118	122	130	129	126
		162	150	137	124	122	121	120	130	133	130	125	130	135
Days of intense storms [3]		4	40	16	21	29	32	33	36	47	43	50	56	53
		72	66	64	56	49	44	38	41	44	48	52	56	56
		55	60	63	62	54	47	44	56	58	59	58	51	45
		77	83	80	68	58	52	51	52	52	45	39	36	29
Days of very intense storms [4]		1	5	8	10	13	16	20	22	22	20	15	18	23
		23	19	16	14	15	17	19	22	23	22	21	18	17
		24	27	24	23	19	17	16	17	16	13	13	15	16
		14	13	15	15	17	21	21	22	26	29	31	32	26

NUMBER OF STORMY DAYS OF STORMS OF VARIOUS CATEGORIES DURING THE

0-110 DAYS FROM DAYS OF INTENSE STORMS

Days	0	1	2	3	4	5	6	7	8	9	10	11	12	13
Days without storm [1]		65	118	150	163	169	169	170	167	169	174	177	183	184
		143	161	170	174	181	184	186	176	171	167	166	175	188
		157	162	174	180	180	181	177	180	183	193	205	205	201
		187	182	179	185	196	200	197	199	205	209	212	219	221
Days of moderate storms [2]		—	6	13	20	28	39	47	54	57	53	55	56	58
		51	44	43	43	41	41	42	50	55	57	59	51	33
		74	68	49	55	55	52	55	52	48	43	37	39	43
		53	53	50	48	43	40	43	42	40	38	37	33	30
Days of intense storms [3]	261	193	132	90	68	53	43	35	32	27	24	19	15	14
		59	52	44	37	32	30	29	30	32	34	34	32	21
		29	29	25	22	18	16	14	13	14	15	13	9	7
		21	22	24	22	18	17	17	17	15	14	12	9	7
Days of very intense storms [4]	—	2	5	8	10	11	10	9	8	8	10	10	7	5
		8	4	4	7	7	6	4	3	3	3	2	3	6
		1	2	3	4	8	12	15	16	14	10	6	8	16
		—	4	8	6	4	4	4	3	1	—	—	—	—

NUMBER OF STORMY DAYS OF STORMS OF VARIOUS CATEGORIES DURING THE

0-110 DAYS FROM DAYS OF VERY INTENSE STORMS

Days	0	1	2	3	4	5	6	7	8	9	10	11	12	13
Days without storm [1]	—	29	54	67	76	80	92	86	92	95	95	89	86	86
		78	83	86	82	84	87	90	93	97	97	97	99	97
		78	81	85	90	95	97	97	98	97	93	92	92	96
		91	86	85	85	77	73	74	77	83	82	85	86	88
Days of moderate storms [2]			1	3	4	6	8	8	6	7	9	14	16	17
		28	24	20	22	21	19	18	17	11	11	14	12	13
		20	19	17	14	13	12	11	11	12	14	15	18	16
		7	13	15	17	24	27	24	22	19	20	18	17	16
Days of intense storms [3]		2	5	7	9	10	12	12	10	8	9	11	12	11
		4	3	4	6	7	7	5	2	2	3	3	3	4
		11	9	7	7	5	5	6	5	5	7	7	4	2
		6	8	8	6	5	6	9	10	8	8	8	9	8
Days of very intense storms [4]	111	83	54	37	25	18	12	8	6	4	1	—	—	—
		4	4	1	1	2	1	1	2	1	—	—	—	—
		5	5	5	3	1	—	—	—	—	—	—	—	—
		10	7	6	6	8	8	7	5	4	4	3	2	2

POOR ORIGINAL

NUMBER OF STORMY DAYS OF STORMS OF VARIOUS CATEGORIES DURING THE

0-110 DAYS FROM DAYS OF MODERATE STORMS

	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	
[1]	454 462 469 456	444 472 478 461	453 471 483 456	462 473 479 453	456 464 463 449	458 460 450 450	457 461 456 443	447 456 445 444	436 456 447 441	429 446 451 444	422 447 436 447	416 443 422 436	405 428 412 442	389 420 399 445	433	417
[2]	133 124 119 132	135 113 114 126	131 113 111 130	125 106 110 129	124 107 123 126	118 109 135 119	120 110 130 118	129 119 136 117	139 120 135 119	143 125 135 120	151 127 150 120	158 137 160 120	168 152 162 110	177 160 164 110	115	122
[3]	49 55 42 26	47 56 41 28	49 56 43 29	57 58 49 30	63 62 55 34	67 63 53 38	68 61 51 48	65 59 53 52	59 57 50 54	57 54 48 50	54 55 47 45	57 55 49 42	62 51 56 43	70 50 66 51	59	72
[4]	23 13 16 21	23 13 13 20	16 13 9 18	13 15 8 19	16 18 6 22	15 18 8 23	14 17 10 19	18 16 12 15	25 16 14 14	30 22 12 14	30 20 12 17	28 18 13 21	24 19 13 24	23 18 14 23	22	18

NUMBER OF STORMY DAYS OF STORMS OF VARIOUS CATEGORIES DURING THE

0-110 DAYS FROM DAYS OF INTENSE STORMS

	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	
[1]	183 191 196 219	184 189 199 215	185 190 205 212	193 202 212 208	194 211 212 208	187 214 205 206	179 217 199 207	173 208 194 205	173 196 195 200	175 184 194 192	172 171 195 184	160 162 194 179	146 161 187 178	139 161 186 174	183	194
[2]	58 41 44 30	53 43 37 30	47 42 30 31	37 37 22 34	34 34 20 37	38 32 22 36	42 30 28 32	46 37 34 30	46 45 36 36	45 52 39 46	45 64 43 57	49 74 44 63	51 76 59 65	53 74 52 67	61	58
[3]	13 19 8 9	15 17 10 10	18 16 10 10	20 16 12 10	22 11 17 9	24 11 25 11	27 10 28 15	29 11 29 20	31 15 27 19	32 20 25 16	35 21 21 11	42 23 22 9	52 24 25 9	58 26 23 11	11	8
[4]	7 10 13 3	9 12 15 6	11 13 16 8	11 9 15 9	11 5 12 9	12 4 9 8	13 4 6 7	13 5 4 6	11 5 3 6	9 5 3 7	9 5 2 9	10 2 1 10	12 - - 9	11 — - 9	6	1

NUMBER OF STORMY DAYS OF STORMS OF VARIOUS CATEGORIES DURING THE

0-110 DAYS FROM DAYS OF VERY INTENSE STORMS

	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	
[1]	88 90 95 91	87 83 91 94	86 83 89 93	79 85 87 95	73 86 87 96	75 85 89 94	85 84 89 94	90 84 90 93	93 87 92 91	93 88 92 90	93 87 89 91	87 84 89 90	83 80 89 89	80 78 92 91	89	89
[2]	16 18 16 16	18 22 18 13	20 21 19 12	24 20 19 11	28 18 19 12	27 19 17 13	22 19 15 15	16 18 13 17	14 15 10 19	13 15 9 20	12 17 10 17	15 20 10 16	20 21 11 16	24 21 7 14	14	12
[3]	10 6 3 6	9 8 4 7	8 8 4 9	11 7 4 8	13 7 3 6	12 7 2 6	10 8 3 4	7 8 5 3	5 7 6 4	5 6 7 4	5 4 7 5	7 3 7 6	7 5 5 8	7 8 5 8	8	[illegible]
[4]	— 1	- 1 1 —	— 2 2 —	— 2 4 —	— 3 5 —	— 3 6 1	— 3 7 1	1 4 6 1	2 5 6 —	3 5 6 —	5 6 8 1	5 7 8 2	4 8 9 1	3 7 10 1	3	4

TABLE 109

SUMMARY DISTRIBUTION OF DISTURBANCE BAYS FOR H OVER THE YEARS (PERCENT)

Observatory	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
All Bays												
Srednikan	15.6	11.3	11.3	7.4	2.6	3.0	3.0	7.4	7.8	12.6	9.5	8.7
Sverdlovsk	15.7	15.9	7.7	4.1	4.5	1.8	1.8	3.1	3.9	15.7	14.5	11.6
Kazan'	13.6	10.6	13.6	6.8	1.9	0.0	1.0	2.9	1.9	11.7	15.5	20.4
Yuzhno Sakhalinsk	20.0	14.4	10.0	5.6	0.0	5.6	4.4	5.6	10.0	7.8	8.9	7.8
Tbilisi	10.4	17.9	7.9	6.8	6.8	3.2	1.0	7.4	6.8	11.6	11.6	8.4
Positive Bays												
Srednikan	14.3	12.4	8.1	8.7	2.5	3.1	3.1	6.8	7.5	13.1	11.8	8.7
Sverdlovsk	15.6	16.3	7.9	4.1	4.8	1.4	1.9	2.9	3.4	16.1	13.9	11.8
Kazan'	13.9	10.9	13.9	6.9	2.0	0.0	1.0	3.0	1.0	11.9	15.8	19.8
Yuzhno Sakhalinsk	17.9	15.4	11.5	5.1	0.0	5.1	3.8	5.1	10.2	9.0	9.0	7.7
Tbilisi	11.2	14.8	7.1	7.1	7.7	3.0	1.1	8.3	7.1	11.2	12.4	8.9
Negative Bays												
Srednikan	18.6	8.6	18.6	4.3	2.9	2.9	2.9	8.6	8.6	11.4	4.3	8.6
Sverdlovsk	16.0	13.3	6.7	6.7	1.3	2.7	1.3	4.0	6.7	13.3	17.3	10.7
Kazan'	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	50.0	0.0	0.0	50.0
Yuzhno Sakhalinsk	33.3	8.3	0.0	8.3	0.0	8.3	8.3	8.3	8.3	0.0	8.3	8.3
Tbilisi	4.8	42.8	14.3	4.8	0.0	4.8	0.0	0.0	4.8	14.3	4.8	4.8

TABLE 110

SUMMARY DISTRIBUTION OF DISTURBANCE BAYS FOR H OVER THE MONTHS OF THE YEAR

Observatory	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948
All Bays											
Srednikan	16.5	11.7	15.2	14.8	8.8	8.4	9.6	7.0	4.0	6.0	0.0
Sverdlovsk	8.3	11.0	7.5	7.7	7.5	12.6	9.1	10.2	7.5	6.7	11.8
Kazan'	5.8	8.7	10.7	7.8	9.7	13.6	6.8	12.6	10.7	4.9	8.7
Yuzhno Sakhalinsk	11.1	11.1	6.7	8.9	18.9	4.4	16.7	7.8	14.4	0.0	0.0
Tbilisi	2.1	4.2	9.4	3.6	6.8	6.2	5.3	18.8	22.4	7.8	14.1
Positive Bays											
Srednikan	17.4	13.0	17.4	13.7	8.7	8.7	7.5	5.6	3.1	5.0	0.0
Sverdlovsk	8.4	11.5	6.5	7.7	7.4	12.9	10.1	10.6	7.9	7.0	10.1
Kazan'	5.9	8.9	10.9	6.9	8.9	13.9	6.9	12.9	10.9	5.0	8.9
Yuzhno Sakhalinsk	8.9	10.3	7.7	10.3	19.2	3.8	15.4	7.9	16.7	0.0	0.0
Tbilisi	0.0	0.6	8.2	4.1	7.1	7.1	4.7	20.0	24.7	8.2	15.3
Negative Bays											
Srednikan	14.3	8.6	10.0	17.1	8.6	7.1	14.3	10.0	2.9	7.1	0.0
Sverdlovsk	8.0	8.0	13.3	8.0	8.0	10.7	4.0	8.0	5.3	5.3	21.3
Kazan'	0.0	0.9	0.0	50.0	50.0	0.0	0.0	0.0	0.0	0.0	0.0
Yuzhno Sakhalinsk	25.0	16.7	0.0	0.0	16.7	8.3	25.0	8.3	0.0	0.0	0.0
Tbilisi	18.2	31.8	18.2	0.0	4.5	0.0	4.5	9.1	4.5	4.5	4.5

TABLE 111

SUMMARY DISTRIBUTION OF DISTURBANCE BAYS OF H OVER THE HOURS OF THE DAY

World time	0–1	1–2	2–3	3–4	4–5	5–6	6–7	7–8	8–9	9–10	10–11	11–12	12–13	13–14	14–15	15–16	16–17	17–18	18–19	19–20	20–21	21–22	22–23	23–24
All Bays																								
Srednikan	0.0	0.0	0.0	0.4	1.3	0.9	2.2	3.9	7.4	11.2	6.9	13.9	15.2	13.9	6.9	5.2	4.8	1.7	1.3	0.9	0.4	0.9	0.9	0.0
Sverdlovsk	2.0	0.4	0.8	0.2	0.6	0.0	0.2	0.6	1.4	1.2	1.6	1.8	2.6	3.9	6.7	8.7	14.0	11.2	12.8	11.0	10.2	4.5	2.6	1.0
Kazan'	1.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	1.0	0.0	2.9	9.7	11.7	8.7	17.5	20.4	9.7	10.6	3.9	1.0
Yuzhno-Sakhalinsk	0.0	0.0	1.1	0.0	0.0	1.1	0.0	3.3	5.6	0.0	4.4	7.8	7.8	14.4	12.2	17.8	11.1	2.2	6.7	1.1	2.2	1.1	0.0	0.0
Tbilisi	2.6	1.6	2.6	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	1.0	1.0	1.0	2.6	2.1	8.3	8.9	6.8	17.2	9.4	17.7	11.5	5.2
Positive Bays																								
Srednikan	0.0	0.0	0.0	0.6	0.6	0.0	0.6	0.6	3.1	9.3	8.1	19.9	19.9	18.6	8.1	5.6	4.3	0.0	0.0	0.0	0.6	0.0	0.0	0.0
Sverdlovsk	0.5	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.7	0.2	0.5	0.7	1.7	3.1	6.7	10.4	15.2	12.8	14.7	13.0	11.6	5.1	1.9	0.7
Kazan'	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	1.0	0.0	3.0	9.9	11.9	8.9	17.8	20.8	9.9	10.9	4.0	0.0
Yuzhno-Sakhalinsk	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.3	0.0	2.6	9.0	9.0	16.7	14.1	20.5	12.8	2.6	7.7	1.3	2.6	0.0	0.0	0.0
Tbilisi	2.9	1.8	2.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.0	0.6	1.2	1.8	6.5	8.8	7.1	18.8	10.0	18.2	12.9	5.9
Negative Bays																								
Srednikan	0.0	0.0	0.0	0.0	2.9	2.9	5.7	11.4	17.1	15.7	4.3	0.0	4.3	2.9	4.3	9.3	5.7	5.7	4.3	2.9	0.0	2.9	2.9	0.0
Sverdlovsk	10.4	1.3	3.9	1.3	3.9	0.0	1.3	3.9	5.2	6.5	7.8	7.8	7.8	7.8	6.5	0.0	7.8	2.6	1.3	0.0	2.6	1.3	6.5	2.6
Kazan'	50.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	50.0
Yuzhno-Sakhalinsk	0.0	0.0	8.3	0.0	0.0	8.3	0.0	25.0	33.3	0.0	16.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.3	0.0	0.0
Tbilisi	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.5	0.0	4.5	9.1	4.5	13.6	4.5	22.7	9.1	4.5	4.5	4.5	13.6	0.0	0.0

TABLE 112

SUMMARY CATALOGUE OF MAGNETIC STORMS

			World time: Start of storm			End of storm			Amplitudes			Active periods: Start		End		
Serial No	No in year	Observatory	Month	Day	Hour	Day	Hour	Duration hours	D'	H γ	Z γ	Day	Hour	Day	Hour	Characteristics
[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[13]	[14]	[15]	[16]	[17]
						1938										
1	1	Leningrad	1	4	02	5	11	33	43	140	130	4	13	4	16	I [Intense]
		Srednikan							>68	308		4	12	4	16	
		Sverdlovsk							43	116	75					
		Irkutsk							38	142	35	4	13	4	15	
		Yuzhno-Sakhalinsk							14	118	6	4	10	4	16	
		Tashkent							15	118	19	4	13	4	17	
2	2	[Same]	1	6	13	8	10	45	35	110	82	7	15	7	22	M+ [Moderate]
												8	01	8	06	
									37	147		6	13	6	19	
												7	17	7	21	
									40	107	58	6	13	6	19	
												7	14	8	07	
									12	100	46	7	15	7	20	
									10	96	4	6	13	6	18	
												7	15	8	07	
									12	82	23	7	15	7	22	
3	3	[Same]	1	12	16	13	22	30	43	137	194	12	16	13	06	M+
									41	175						
									26	86	63	12	16	13	10	
												13	15	13	22	
									15	89	31	12	22	13	02	
									8	119	15	12	17	13	10	
4	4	[Same]	1	16	07	19	19	84	93	840	570	16	22	17	23	VI [Very
												18	15	18	23	
									>68	568		16	22	17	04	intense]
												17	13	17	19	
												18	11	18	23	
												19	10	19	19	
									75	549	241	17	00	18	00	
									67	472	116	16	22 37	17	03	
												17	14	18	02	
									38	240	25	16	22 36	17	24	
									70	34	162	16	23	17	08	
												17	12	17	18	
												18	15	18	23	
												19	14	19	19	
5	5	[Same]	1	20	12	23	00	60	128	460	510	21	23	22	22	VI
									68	560		20	12	20	20	
												21	22	22	19	
									103	483	518	21	22	22	21	
									68	471	499	22	08	22	14	
									27	239	>48	21	22	22	11	
									27	217	68	20	14	20	20	

[1]	[2]	[3]	[4][5][6][7]	[8][9]	[10]	[11]	[12]	[13]	[14][15]	[16]	[17]
6	6	[Same]	I 25 14 56	27 00	36	221	1320	660	25 12	26 03	VI
						>68	>560		25 12	26 03	
						111	988	546	25 12	26 02	
						68	566	252	25 17	26 01	
						40	336	56	25 16	25 24	
						31	177	50	25 12	25 23	
7	7	[Same]	I 31 03	1 00	16	66	280	230	31 19	31 23	M
						35	253				
						59	263	109	31 19	1 00	
						22	119	49	31 19		
						8	67	21			
						16	103	16	31 19	31 22	
8	8	[Same]	II 6 03 08	7 22	4[illegible]	52	152	182	6 03	6 08	M
						no record			6 16	6 23	
						45	152	93	6 16	7 02	
						29	127	33			
						88	135	6			
						15	154	50	6 04	7 00	
									7 06	7 19	
9	9	[Same]	II 8 10 37	10 15	52	51	300	440	8 16	8 22	M
						no record					
						47	138	153	8 16	8 24	
						29	148	51	8 12	8 19	
						12	99	11			
						12	163	27	8 11	8 22	
10	10	[Same]	II 13 20 36	14 23	26	47	200	240	14 11	14 18	M
						no record					
						46	141	90	14 09	14 19	
						22	149	39	14 11	14 18	
						12	86	6			
						17	162	51	14 12	14 18	
11	11	[Same]	III 4 16	6 13	45	45	310	390	5 13	5 21	I
						>46	>345		5 13	5 21	
						47	113	116	5 12	5 20	
						21	130	34	5 13	5 20	
						8	116	4			
						14	158	60	5 05	5 20	
12	12	[Same]	III 21 21	24 14	65	80	340	390	22 12	23 03	I
									23 19	24 05	
						55	347		24 08	24 11	
									25 23	26 03	
									26 11	26 19	
						33	238	158	22 05	23 02	
									23 16	24 01	

POOR ORIGINAL

[1]	[2]	[3]	[4] [5] [6]	[7] [8]	[9]	[10]	[11]	[12]	[13] [14]	[15] [16]	[17]
12	12	[Same]	III 21 21	24 14	65	24	249	60	22 05	22 14	I
						7	130	11			
						13		60	22 04	22 14	
									23 05	23 10	
									23 19	24 02	
13	13	[Same]	IV 13 11 40	15 17	53	48	300	370	13 21	14 00	I
									14 05	14 13	
						42	288		14 04	14 13	
						43	200	111	14 04	14 13	
						34	207	53	14 08	14 13	
						11	112	11			
						24	158	62	13 12	13 18	
									14 04	14 13	
14	14	[Same]	IV 16 05 47	19 02	68	255	1360	550	16 05	16 16	VI
						>68	>560		16 06	16 16	
						61	292	524			
						113	>540	362	16 06	16 09	
						65	430	122	16 06	16 15	
						56	365	89	16 06	16 14	
15	15	[Same]	IV 22 12	24 02	38	31	291	278	23 11	23 23	M
						67	266		23 09	23 21	
						31	123	125	23 09	23 22	
						22	113	63	23 11	23 16	
						8	75	7			
						9	115	48	22 16	23 00	
									23 12	23 20	
16	16	[Same]	V 4 13	6 17	52	37	232	235	4 14	4 20	M+
						26	161		4 15	4 20	
						22	155	67	4 14	5 00	
						10	101	28	4 15	4 20	
						4	73	7	4 15	4 19	
						14	93	51	4 14	5 00	
17	17	[Same]	V 11 15 54	13 02	34	142	1190	700	11 16	12 07	VI
						>55	>491		11 18	12 01	
									12 05	12 10	
						61	360	450	11 17	12 02	
						55	498	154	11 21	12 01	
						20	462	70			
						25	307	54	11 16	1 07	
18	18	[Same]	V 14 06	15 18	36	43	250	263	14 11	14 17	M
									14 21	15 03	
						49	277				
						36	135	142			
						17	148	75	14 10	14 15	
						10	73	11			
						13	95	40	14 08	15 05	

[1]	[2]	[3]	[4][5][6]	[7][8]	[9][10]	[11]		[12]	[13][14]	[15][16]	[17]
19	19	[Same]	V 28 06	30 14	56	27 25 24 16	240 210 154 39	240 97 27	29 10 28 10 28 06	29 18 28 18 28 08	M+
						11	129	63			
20	20	[Same]	VI 7 22 02	9 10	36	20 28 19 18	183 176 135 110	35 31 26	8 09	8 22	M
						55 10	61 97	7 41	7 22 8 18	8 10 8 23	
21	21	[Same]	VI 12 17 55	14 03	33	29 43 35 29	193 217 141 147	92 62 42	13 05 12 23 12 18 13 05	13 13 13 09 13 18 13 11	M
						9 17	61 83	18 44	12 18	13 16	
22	22	[Same]	VII 4 12 00	5 20 no data	32	56 30 33	220 195 123	280 153	4 12	4 22	M
						4 17	37 98	7 45	4 12	4 22	
23	23	[Same]	VII 9 19 52	11 02	30	28 29 21	182 126 133	139 57	9 23 10 18 9 21 9 20 10 17	10 02 10 23 10 02 10 02 10 23	M
						5	131	34			
						12	98	25	9 20 10 17	10 07 10 23	
24	24	[Same]	VII 15 03 14	16 23 no data	44	71 47 27	820 301 197	570 288 96	15 11 15 07 15 14	15 24 16 02 15 24	I
						12 19	157 114	9 52	15 06	16 03	
25	25	[Same]	VII 30 04 35	31 01 no data	20	26 35 26	193 180 149	115 88 80	30 11 30 05 30 17 30 07	30 13 30 16 30 22 30 13	M
						19 10	125 151	17 38	30 04	30 13	

[1]	[2]	[3]	[4]	[5][6]	[7][8]	[9]	[10]	[11]	[12]	[13][14]	[15][16]	[17]
26	26	[Same]	VIII	1 08	3 01	41	28	260	230			I
							32	209				
							29	192	81	1 12	2 16	
										2 04	3 04	
							16	183	35			
							4	121	4			
							15	63	34	1 16	1 18	
27	27	[Same]	VIII	3 16	6 10	66	56	260	390	3 21	4 02	I
										4 05	4 13	
							>64	397		3 21	3 24	
										4 05	4 10	
							38	217	164	3 22	4 17	
							32	224	83	3 21 37	3 24	
										4 05	4 10	
							7	150	17	3 20	3 24	
										4 05	4 12	
							17	225	44	3 21	4 16	
28	28	[Same]	VIII	11 03 20	13 10	55	40	300	300	11 11	11 18	I
							>63	519		11 11	11 16	
							45	165	170	11 07	11 19	
							29	137	78	11 11	11 18	
							14	103	16	11 11	11 19	
							18	150	49	11 11	11 18	
29	29	[Same]	VIII	22 13 53	24 00	34	31	221	70	22 14	22 18	M
										23 03	23 15	
							33	187		23 05	23 11	
							23	166	37			
							18	150	40			
							8	94	4	23 06	23 15	
							10	115	21	22 14	23 17	
30	30	[Same]	IX	13 18 37	16 04	57	85	610	600	13 18	14 05	VI
										14 14	15 02	
										15 10	15 21	
							68	557		14 14	14 20	
										15 07	15 17	
							67	217	309	14 12	15 04	
										15 12	15 21	
							44	273	148	15 08	15 16	
							6		3	14 13	14 20	
										15 10	15 16	
							26	187	70	13 19	14 04	
										14 14	14 24	
										15 10	15 21	
31	31	[Same]	IX	26 07 25	27 01	18	110	121	201	26 13	26 24	I
							60	389		26 10	26 21	
							45	211	122			
							22	150	60			
							12	122	8			
							15	>120	40	26 08	26 22	

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[1]	[2]	[3]	[4][5][6]	[7][8]	[9]	[10]	[11]	[12]	[13][14]	[15][16]	[17]
32	32	[Same]	IX 27 22 00	28 22	24	128	471	330	27 22	28 09	VI
						>51	340		27 22	28 05	
						44	282	135			
						35	252	51	27 22		
						16	116	21	28 00	28 06	
33	33	[Same]	IX 30 10 22	4 19	105	106	350	330	30 19	1 06	I
						40	288		30 18	30 22	
						60	301	122			
						22	348	51	1 02	1 07	
						10	107	8	1 02	1 07	
						11		23	30 10	1 10	
34	34	[Same]	X 7 06 14	8 22	40	115	780	560	7 13	7 21	I
						>67	186		7 12	7 21	
						68	299	266	7 12	7 21	
						32	164	73	7 13	7 21	
						16	146	10	8 01	8 08	
						18	198	71	7 10	7 17	
									8 02	8 12	
35	35	[Same]	X 23 05	28 21	88	50	170	300	24 21	25 00	I
									25 18	25 23	
						>61	318		24 09	24 17	
									25 11	25 14	
									26 09	26 18	
									27 07	27 18	
						24	164	117	24 14	25 02	
									25 10	26 00	
									26 09	27 00	
									27 12	27 19	
						9	84				
						9	62	6	26 05	26 18	
									27 02	27 18	
						12		68	23 06	23 07	
									23 10	23 23	
									24 14	24 16	
									25 06	25 19	
									26 10	26 22	
									27 05	27 20	
36	36	[Same]	XI 8 09	10 05	44	54	250	340	9 12	9 22	
						48	324		8 12	8 17	
									9 11	9 17	
						34	164	131	8 10	9 02	
									9 12	9 22	
						28	123		9 11	9 17	
						8	55	4	9 14	9 17	
						13	98	60	8 10	8 13	
									9 12	9 22	

[1]	[2]	[3]	[4][5][6]	[7][8]	[9]	[10]	[11]	[12]	[13][14]	[15][16]	[17]
37	37	[Same]	XI 17 05	18 01	20	46	111	221	17 14	17 16	M
									17 20	17 22	
						53	333		17 14	17 18	
						52	132	100			
						19	145		17 14	17 16	
						9	61	7	17 12	17 16	
						14	93	36	17 12	17 22	
38	38	[Same]	XI 24 08	25 00	16	361	71	127	24 14	24 19	M+
						32	177		24 11	24 19	
						30	65	55			
						16	61	24			
						6	41	4			
						8	40	15	24 09	24 19	
39	39	[Same]	XII 2 10	4 01	39	70	120	300	2 19	3 00	M
						60	132		2 17	2 23	
						34	147	127	2 14	3 04	
									3 12	4 02	
						6	73	8			
						10	106	41	2 18	2 22	
									3 12	3 23	
40	40	[Same]	XII 10 11	11 10	24	68	150	300	10 14	11 00	M
						53	268		10 14	10 22	
						49	161	108	10 14	11 00	
						21	125	27			
						10	70	7			
						12	112	38	10 14	10 23	
41	41	[Same]	XII 16 08	18 23	63	65	238	280	16 18	16 21	M+
						59	359		16 17	16 24	
									18 11	18 20	
						44	164	90	18 12	18 22	
						18	99	42			
						9	90	8	16 16	16 21	
									18 11	18 19	
						15	152	37	16 08	18 01	
									18 10	18 21	
				1939							
42	1	[Same]	II 1 12	3 00	36	43	158	104	1 19	2 02	M+
									2 17	2 19	
						29	114		1 18	1 24	
									2 17	2 23	
						25	123	31			
						12	65	13			
						5	36	6			
						8	76	25	1 13	1 24	
									2 17	2 24	

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43	2	[Same]	II	5 19 51	7 07	35	43	300	310	6 12	6 24	I
							>67	535		6 10	6 21	
										7 09	7 21	
							43	181	110	6 09	7 02	
							38	164	57	6 12	6 19	
							15	109	14	6 10	6 24	
							15	163	47	6 09	6 24	
44	3	[Same]	II	24 11	26 00	37	139	1170	570	24 17	25 02	VI
							>68	400		24 17	25 02	
										25 07	25 17	
							76	442	313	24 16	25 02	
										25 04	26 00	
							66	242	141	24 17	25 02	
							30	155	32	24 17	25 16	
							22	187	59	24 17	25 06	
45	4	[Same]	II	28 14	3 7 05	161	18	89	71	1 10	2 06	VI
										3 21	4 03	
										4 15	5 00	
							21	185		1 14	1 19	
							25	941	48			
							10	54	9			
							10	59	27	28 15	28 18	
										1 07	2 04	
46	5	[Same]	III	15 05	17 08	51	30	94	89			M
							21	124		15 16	15 19	
										16 09	16 14	
							3	89	6			
							13	58	35	15 08	15 18	
										16 09	16 14	
										17 04	17 21	
47	6	[Same]	III	21 05	24 23	90	41	184	119	22 10	22 17	M+
							35	188		22 09	22 18	
							32	150	63			
							14	79	42	22 15	22 17	
							4	87	4	21 05	21 12	
										22 06	22 23	
							12	93	48	21 05	21 12	
										21 17	21 21	
										22 06	22 23	
										23 19	23 23	
48	7	[Same]	III	27 17	4 5 16	215	67	420	430	27 17	28 00	I
										28 14	29 01	
										29 10	29 22	
							>68	>356		27 18	27 21	
										28 14	28 22	
										29 17	29 22	

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48	7	[Same]	III 27 17			48	210	183	28 14 29 04	29 00 30 00	I
						33	184	93	28 14	29 01	
						18	96	21	27 18 28 14	27 24 28 23	
						16	164	45	28 14 4 19	29 23 4 22	
49	8	[Same]	IV 9 12	12 14	69	46	195	200	9 18 10 19	10 02 11 01	M
						38	185		10 08 11 07	10 14 11 12	
						36	142	66	9 18 10 12	10 02 11 00	
						23	129	43	10 12 10 23 11 10 12 12	10 14 11 01 11 12 12 13	
						6 14	48 96	6 32	12 06 9 12	12 13 11 03	
50	9	[Same]	IV 16 21 27	22 02	.125	98	920	690	17 02 18 11 19 12	17 22 18 23 19 19	VI
						68	577		17 01 18 12 19 13	17 22 18 20 19 20	
						57	280	368	17 02 18 06 19 12	18 00 18 09 19 20	
						50	225	104	17 02	17 18	
						18 24	160 293	64 73	17 01 16 21	17 22 17 17	
51	10	[Same]	IV 22 13	24 02	37	59 56	580 >330	270	23 05 23 05 23 14	23 20 23 11 23 20	I
						55 32	242 169	144 109	23 04 23 06	23 20 23 16	
						16 16	118 149	29 65	23 05 38 23 06	23 19 23 20	
52	11	[Same]	IV 24 17 36	26 05	35	98 >52	1100 >426	500	24 17 24 18	25 03 25 03	VI
						70 24	498 424	331 162	24 18 24 17 36	25 06 25 04	
						25 21	318 417	52 45	24 17 36 24 18	25 04 25 04	
53	12	[Same]	V 1 06 40	3 05	46	67 44	440 431	450	1 11 1 11	2 17 2 15	I
						48 33	220 199	208 63	1 12 1 11	2 12 1 11	

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[1]	[2]	[3]	[4][5][6]	[7][8]	[9]	[10]	[11]	[12]	[13][14]	[15][16]	[17]
53	12	[Same]	V 1 06 40						1 19	2 09	I
						12 17	156 148	13 48	2 03 1 12	2 15 2 17	
54	13		V 5 20 43	9 18	93	42 33	380 243	350	6 12	7 15 6 01	
									7 05 8 05	7 10 8 15	
						34 26	269 307	120 59	6 05 5 20 44	7 07 5 25 44	
						5	65	8	6 12 5 21	6 19 7 07	
55	14	[Same]	V 21 13	23 00	35	46	190	170	21 14 22 09	22 00 22 11	M+
						37	185		21 14 22 09	21 21 22 11	
						30 25	105 103	63 55	22 00	22 02	
						14	75	31	21 14 22 05	21 23 22 10	
56	15	[Same]	V 23 16	26 16	72	32 16 27 21	180 217 179 140	170 66 14	23 18 24 00	24 04 24 07	M
						3 6	20 66	9 18	23 18	23 24	
57	16	[Same]	V 27 20 50	30 00	51	36 40	186 324	202	28 22 28 01 29 04	29 13 28 09 29 14	M
						30 26	153 149	106 56	28 20 28 05 28 03	30 00 28 10 28 10	
						9 16	113 79	74 45	29 05 27 21 28 22	29 14 28 10 29 20	
58	17	[Same]	VI 13 03	15 00	45	36 63	350 463	350	14 07 14 07	14 15 14 12	I
						32 26	231 188	180 106	14 07	14 12	
						18 10	157 182	31 59	14 07 14 17	14 12 14 22	
59	18	[Same]	VI 26 20 20	27 18	22	18 33	190 176	120	27 09 27 04	27 17 27 17	M
						27 16	151 147	56 55	27 09	27 11	
						4 12	53 92	3 33	26 20 27 04	26 21 27 13	

[1]	[2]	[3]	[4][5][6]	[7][8]	[9]	[10]	[11]	[12]	[13][14]	[15][16]	[17]
60	19	[Same]	VI 28 12	29 18	30	19	170	150	29 03	29 17	M
						21	1[illegible]0		29 0[illegible]	[illegible] 14	
						22	101	63			
						18	130	48			
						7	56	9			
						11	65	22	29 03	29 17	
61	20	[Same]	VII 3 00 38	4 00	23	45	340	310	3 11	3 20	I
						53	284		3 07	3 19	
						28	164	167	3 10	3 20	
						24	159	70	3 10	3 16	
						9	93	4	3 10	4 17	
						15	112	61	3 07	3 22	
62	21	[Same]	VII 4 14 07	6 10	44	66	540	640	4 14	5 23	I
						63	306		4 17	4 23	
									5 06	5 11	
									5 15	5 19	
						39	167	162	4 14	5 02	
									5 07	6 00	
						28	207	128	4 17	4 22	
									5 07	5 15	
									5 15	5 20	
						13	163	13	4 14 10	4 24	
									5 15	5 19	
						15	89	48	4 14	5 02	
63	22	[Same]	VII 14 03	15 03	24	32	208	167	14 11	14 16	M+
						27	228		14 06	14 14	
						26	133	63			
						10	105	36	14 11	14 13	
						4	66	15	14 12	14 14	
						10	61	34	14 04	14 08	
64	23	[Same]	VII 16 06	18.03	45	25	180	100			M
					no record						
						29	153	41			
						5	42	9	16 17	16 22	
						14	69	35	16 09	17 09	
65	24	[Same]	VII 19 22 03	21 00	26	41	169	223	20 11	20 17	M
					no data						
						37	161	142			
						24	130	66	20 11	20 19	
						8	62	4			
						9	103	48	20 12	20 21	
66	25	[Same]	VIII 21 09 57	22 18	32	48	240	130			M
						53	358		21 10	21 15	
						33	248	144	21 10	21 16	
						22	205	68	21 10		
						10	108	7	21 09 56	21 16	
						10	77	60	21 10		

[1]	[2]	[3]	[4][5][6]	[7][8]	[9]	[10]	[11]	[12]	[13][14]	[15][16]	[17]
67	26	[Same]	VIII 11 12	13 18	54	51	320	320	12 00	12 12	I
						67	131		12 03	12 12	
						43	210	174	12 02	12 17	
						35	226	136	12 01	12 12	
						18	196	62	12 02	12 12	
						19	243	57	12 02	12 17	
68	27	[Same]	VIII 16 10	17 07	21	60	410	390	16 13	16 17	I
						>61	145		16 13	16 17	
						36	168	139	16 12	17 04	
						26	131	46	16 13	16 17	
						8	157	12	16 12	17 02	
						15	140	48	16 13	16 24	
69	28	[Same]	VIII 21 21 24	24 02	52	112	1220	900	22 01	23 16	VI
						>67	495		22 11	23 01	
									23 05	23 15	
						68	318	480	22 07	23 10	
						52	268	141	22 01 41	22 01 41	
									22 11	22 19	
									23 08	23 15	
						23	141	14	22 01 40	22 18	
						20	345	69	22 01	23 13	
70	29	[Same]	IX 2 21 43	4 00	26	29	219	135	3 02	3 12	M
						50	203				
						34	169	39	2 22	3 12	
						24	159	38	3 09	3 12	
						4	80	4	3 05	3 12	
						22	104	34	2 22	3 12	
71	30	[Same]	IX 17 02	18 02	24	83	700	480	17 12	17 20	I
						56	414		17 15	17 21	
						45	159	168	17 10	18 00	
						29	136	60			
						9	73	6	17 13	17 20	
						17	120	39	17 12	17 20	
72	31	[Same]	IX 19 06	20 20	38	24	212	270	19 14	19 20	M
						37	181		19 14	19 20	
									20 06	20 10	
						27	112	93			
						21	88	50	19 15	19 18	
						8	70	13	19 10	19 18	
									20 05	20 11	
						10	80	28	19 10	20 20	
73	32	[Same]	X 3 08	4 22	38	46	360	430	3 17	4 04	M
						49	348		3 17	3 21	
									4 12	4 14	
						40	171	137			
						31	201	65	3 17	4 04	
						6	107	15	3 17	3 20	
						16	98	42	3 17	4 04	

[1]	[2]	[3]	[4][5][6]	[7][8]	[9]	[10]	[11]	[12]	[13][14]	[15][16]	[17]
74	33	[Same]	X 13 02 04	19 21	163	191	910	860	13 02	13 09	VI
									13 17	13 21	
									14 17	15 05	
						>67	571		13 02	13 09	
									13 16	13 24	
									14 08	14 18	
									15 01	15 06	
						70	453	434	13 17	14 00	
									14 02	14 22	
						51	245	171	13 18	13 24	
									14 09	14 18	
									15 15	15 19	
						19	230	33	13 15	13 24	
									14 07	14 15	
									15 03	15 08	
						28	125	56	14 07	15 08	
75	34	[Same]	XI 13 04	15 00	44	>42	230	300			M
						48	377		13 09	13 18	
						22	136		13 14	13 22	
						21	145	63			
						10	123	97	13 07	13 17	
						11	150	85	13 10	13 21	
76	35	[Same]	XI 24 14	26 22	56	50	130	100			M+
						77	114		25 20	25 23	
						37	94	64	25 20·	26 02	
						8	80	14			
						10			24 14	24 24	
77	36	[Same]	XII 6 20	9 20	72	60	160	220	6 20	7 04	M
									8 14	8 21	
						57	254		6 20	6 24	
									7 12	7 18	
									8 13	8 18	
						47	151	87	6 20	7 05	
									7 14	8 00	
						28	146	52	6 20	7 14	
						8	117	10	07 03	07 15	
									08 15	08 18	
									09 13	09 19	
						177	120	21	6 20	7 14	
									7 14	7 24	
									8 06	8 22	
									9 11	9 19	
78	37	[Same]	XII 21 01	22 22	45	43	80	140			M+
						35	183		22 13	22 17	
						35	135	69			
						11	96	31			
						5	81	3			
						9	100	24	21 09	21 21	
									22 12	22 21	

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[1]	[2]	[3]	[4]	[5][6]	[7][8]	[9]	[10]	[11]	[12]	[13][14]	[15][16]	[17]
79	1	[Same]	I	3 14 40	5 06	39	105	910	350	3 15	3 22	VI
							63	414		3 15	3 22	
										4 11	4 16	
							58	197	248	3 14	4 02	
							45	186	58	3 14 40	3 17 40	
							16	173	17	3 14 39	3 22	
							27	285	36	3 15	3 21	
80	2	[Same]	I	10 10	13 00	38	62	537		10 13	10 20	M+
										11 18	11 22	
							23	134	111	10 12	10 27	
							17	129	42			
							10	67	5	10 12	10 19	
							9	179	27	10 10	10 20	
81	3	[Same]	I	18 10	19 03	17	106	340	350	18 15	18 21	I
							>68	>388		18 13	18 19	
							61	214	157	18 13	19 00	
							21	167	58	18 13	18 20	
							10	84	21	18 14	18 19	
							26	120	20	18 14	18 22	
82	4	[Same]	I	31 12	3 23	83	29	230	138	31 17	31 21	M
										1 17	1 21	
										31 13	1 02	
										1 11	1 22	
							38	124	85	31 11	1 02	
										1 12	2 00	
							23	130	45			
							4	74	6	31 12	31 18	
83	5	[Same]	II	24 22 09	26 00	26	35	97	197	25 12	25 19	M
							38	245		25 10	25 19	
							36	113	86	25 12	25 16	
							21	123	36	25 12	25 19	
							8	86	9	25 09	25 18	
							12	132	20	25 11	25 22	
84	6	[Same]	III	19 08	21 06	46	38	149	194			M
							45	126				
							27	112	64			
							3	72	8			
							12	104	26	19 12	20 21	
85	7	[Same]	III	23 06 18	28 03	117	293	1400	708	24 13	26 03	VI
							>67	>554		24 14	25 15	
										25 20	26 03	
										26 18	26 20	
							138	1526	989	23 20	25 12	

[1]	[2]	[3]	[4]	[5][6]	[7][8]	[9]	[10]	[11]	[12]	[13][14]	[15][16]	[17]
85	7	[Same]	III	23 06 18	28 03	117	82	438	423	24 14	25 11	VI
							5	93	6			
							>42	>365	99	24 06	25 11	
86	8	[Same]	III	29 12	02 00	84	131	1416	560	29 12	31 03	VI
										31 10	31 19	
							>68	557		29 16	31 02	
										31 10	31 18	
							113	776	802	29 12	31 12	
										31 10	01 00	
							82	490	222	29 16	30 19	
										31 09	31 18	
							40	295	49	29 12	30 17	
							30	316	111	29 16	30 19	
87	9	[Same]	IV	02 16	03 23	31	81	580	520	02 19	03 10	I
							43	483		02 19	03 10	
							79	330	52	02 18	03 08	
										03 11	03 22	
							30	327	65	03 01	03 07	
							14	202	11	03 01	03 08	
							18	199	45	02 18	03 02	
88	10	[Same]	IV	25 02 05	27 02	48	66	540	380	25 18	26 03	I
							>38	333		25 18	25 24	
							50	245	142			
							25	216	81	25 02	25 06	
							15	118	13	25 17	25 24	
							16	170	26	25 17	26 04	
89	11	[Same]	V	17 19	19 03	32	32	195	184	18 08	18 15	M
							39	277		18 07	18 13	
							25	156	125			
							7	77	18	18 05	18 15	
							11	133	37	18 05	18 15	
90	12	[Same]	V	23 17 54	25 03	33	50	300	180	24 04	24 14	I
							47	209		24 04	24 14	
							42	241	115			
							26	250	102	24 03	24 12	
							16	99	15	24 03	24 13	
							16	175	72	24 04	24 13	
91	13	[Same]	V	26 01	28 22	69	34	190	170	26 21	27 03	M+
							28	114				
							23	140	68			
							16	124	33			
							10	51	6			
							14	96	42	26 21	27 06	
92	14	[Same]	VI	05 08	10 06	118	33	167	134	06 03	06 15	M
										06 21	07 06	

[1]	[2]	[3]	[4][5][6]	[7][8]	[9]	[10]	[11]	[12]	[13][14]	[15][16]	[17]
92	14	[Same]	VI 05 08	10 06	118	39 27	203 130	89	06 01 05 20 06 20 07 20	06 13 06 06 07 06 08 06	M
						10 15	58 117	7 52			
93	15	[Same]	VI 14 08 00	15 19	35	49 37 34 23	200 220 184 189	220 112 70	14 08 14 17	14 24 14 23	I
						6 15	131 52	31 35	14 15 14 08	14 23 14 24	
94	16	[Same]	VI 25 02 55	26 03	24	237 68 74 45	1240 532 707 360	400 411 132	25 03 25 03 25 09 25 09	25 20 25 20 25 22 25 16	VI
						10 34	238 216	49 154	25 03 25 09	25 22 26 20	
95	17	[Same]	VII 13 08 00	16 03	67	56 49 43 20	400 269 206 158	270 159 55	13 10 13 10 13 10	13 18 13 18 13 15	I
						10 12	95 136	11 71	13 10 13 10	13 17 13 19	
96	18	[Same]	VIII 02 13	03 19	30	41 37 32	255 158 153	209 97	03 13 03 10 03 10	03 18 03 19 03 18	M
						6 17	92 110	9 44	03 13 03 14	03 18 03 19	
97	19	[Same]	VIII 09 03	10 01	21	35 44 27 21	231 229 145 100	263 150 69	09 11 09 11	09 21 09 15	M+
						6 12	53 62	7 51	09 09	09 21	
98	20	[Same]	VIII 31 22	01 17	19	31 19 28	153 95 133	240 91	01 11 01 10	01 16 01 16	M
						8 12	41 92	7 46	01 12	01 17	
99	21	[Same]	IX 26 17 04	29 00	55	95 41	580 467	620	26 17 26 17 28 06	27 03 29 20 28 14	I

[1]	[2]	[3]	[4][5][6]	[7][8]	[9]	[10]	[11]	[12]	[13][14]	[15][16]	[17]
99	21	[Same]	IX 26 17 04	29 00	55	58 27	238 202	244 112	26 17 26 17	27 04 26 20	I
						14	178	43	26 17	27 03	
100	22	[Same]	IX 30 18	01 22	28	78 44 39	420 385 128	600 198	01 16 01 18 01 16	01 20 01 20 01 21	I
						9	41	27			
101	23	[Same]	X 06 09 50	09 00	62	85 55	270 260	450	07 14 07 14 08 04	08 04 07 22 08 10	I
						47	152 162	167 58	08 15 07 12	08 20 08 05	
						13	85	42	07 09	08 09	
102	24	[Same]	X 26 07	28 06	47	51 42 39 29	99 188 137 113	182 64 22	26 14 26 14 26 14 26 14	26 23 26 18 27 00 26 18	M+
						12	134	23	26 07	26 20	
103	25	[Same]	XI 04 12	05 21	33	42 35	108 160	258	04 14 04 12 05 07	05 01 04 20 05 15	M
						28	87	86	04 14	05 00	
						10	90	25	04 12	05 01	
104	26	[Same]	XI 12 07	15 00	65	52 42 40 20	173 141 141 136	251 132 61	12 21 12 10 12 15	13 07 13 07 12 21	M
						12	68	42	12 07 13 13	13 09 13 17	
105	27	[Same]	XI 20 15	23 15	72	51 38	178 197	160	21 21 21 09 22 08 23 07	22 03 21 14 22 12 23 14	M+
						25	140	80	21 22 22 19	22 12 23 15	
						7	105	27	21 07	21 12	

[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[13]	[14]	[15]	[16]	[17]
105	27	[Same]	XI	20	15	23	15	72								M+
									11	135	34	21	05	21	15	
												22	05	22	13	
												23	05	23	14	
106	28	[Same]	XI	25	09	26	19	34	50	260	270	25	14	25	18	I
									68	442		25	12	25	17	
									53	149	155	25	09	26	04	
									40	156	33	25	12	25	19	
									18	164	28	25	09	25	22	
107	29	[Same]	XI	28	21	04	20	143	41	94	201	29	13	29	24	M
												02	11	02	19	
									68	230		29	12	29	18	
												02	10	02	12	
									33	119	89	29	12	30	00	
												03	09	03	22	
									19	136	31	29	12	29	17	
									10	120	28	29	09	30	00	
108	30	[Same]	XII	21	57	24	00	98	78	350	350	20	12	21	00	I
									62	289		20	10	20	18	
									40	169	126	20	09	21	00	
												23	12	24	00	
									27	131	37	20	12	20	18	
									13	130	25	20	10	21	20	
109	31	[Same]	XII	28	21	02	00	99	42	114	79					M
									46	133		30	07	30	20	
									30	115	73	29	14	30	00	
												01	14	02	00	
									15	118	26					
									10	105	18	29	15	29	23	
												30	04	30	20	

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[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[13]	[14]	[15]	[16]	[17]
110	1	[Same]	I	17	11	20	00	61	69	213	186	17	16	18	01	M
												18	16	19	01	
									60	437		17	13	17	21	
									66	172	74	18	16	19	02	
												19	12	19	17	
									19	157	47	17	13	17	19	
									11	156	9					
									22	119	30	17	13	17	18	
111	2	[Same]	I	23	13	27	24	107	38	133	209	23	15	23	19	M
												24	12	24	22	
									68	388		23	13	23	19	
												21	12	24	19	

POOR ORIGINAL

[1]	[2]	[3]	[4]	[5][6]	[7][8]	[9]	[10]	[11]	[12]	[13][14]	[15][16]	[17]
111	2	[Same]	I	23 13	27 24	107	42	105	106	24 12	24 22	M
							34	140	54	23 13	23 19	
										24 12	24 24	
							15	97	10	23 13	23.20	
										24 12	24 18	
							15	125	35	23 13	23 19	
										24 11	24 21	
										25 07	25 17	
										27 13	27 19	
112	3	[Same]	II	13 07	15 22	63	39	114	125	13 12	14 00	I
							>59	219				
							46	116	67	13 12	14 00	
										14 16	14 17	
							30	128	21	13 13	13 18	
							12	104	7			
							14	105	25	13 15	13 22	
113	4	[Same]	II	21 12	26 16	124	70	257	292	21 13	21 23	I
										22 14	22 24	
										23 16	23 24	
										24 16	24 20	
										25 18	25 19	
							>53	423		21 12	21 18	
										22 10	22 23	
										23 12	23 22	
										24 10	24 17	
										25 10	25 15	
							48	179	67	21 12	22 00	
										22 14	23 00	
							23	128	31	21 13	21 22	
							9	75	9	21 12	21 18	
							11	86	25	21 14	21 22	
114	5	[Same]	III	01 03 57	06 20	135	148	1558	471	01 04	01 24	VI
										03 15	03 19	
										04 21	05 02	
										05 14	05 23	
							>70	>580		01 06	01 24	
										02 08	02 11	
										03 09	03 13	
										03 15	03 19	
										05 12	05 15	
							229	1895	1322	02 19	03 02	
										03 10	03 19	
										04 14	05 02	
										05 12	06 00	
							15	985	618	01 14	01 20	
							80	735	163	01 04	01 22	
										02 08	02 12	
										03 09	03 13	
							68	570	222	01 08	01 23	
115	6	[Same]	III	13 15	16 02	59	57	267	401	14 01	14 03	I
										14 11	14 14	
										14 18	14 24	

[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[13]	[14]	[15]	[16]	[17]
115	6	[Same]	III	13	15	16	02	59	>64	>513		14	06	14	14	I
									61	156	237	14	00	15	00	
									46	225	82	14	09	11	13	
									15	104	7	14	01	14	13	
									17	176	56	14	09	14	17	
116	7	[Same]	III	19	11	22	23	84	69	197	195	19	12	19	16	M
												20	16	20	17	
												21	18	21	21	
												22	17	22	20	
									>50	212		19	12	19	15	
												20	10	20	14	
									40	141	113	19	12	19	18	
												20	12	20	17	
									21	142	51					
									10	90	11					
									12	124	35	19	11	19	19	
117	8	[Same]	III	28	00	31	14	86	84	799	468	28	13	28	22	VI
												29	18	29	24	
												30	16	31	22	
									>70	507		28	09	28	22	
												29	20	29	23	
												30	16	31	12	
									55	299	237	28	08	29	00	
												30	16	31	15	
									38	263	126	30	16 36	31	01 36	
									25	167	29	28	08	28	22	
												30	17	31	13	
									22	238	68	28	09	28	22	
												29	16	29	23	
												30	17	31	13	
118	9	[Same]	IV	24	07	26	11	52	71	290	280	24	09	24	21	VI
												25	15	25	21	
									>55	>571		24	08	24	22	
									69	193	128	24	07	25	00	
									31	164	66	24	09	24	22	
									18	131	22	24	08	24	22	
									22	120	60	24	09	24	22	
119	10	[Same]	VI	09	13	15	13	148	15	94	36	10	13	10	18	M
									27	117		10	13	10	17	
									33	141	95	10	13	10	21	
									19	142	36	10	13 17	10	17	
									6	72	6	10	09	10	18	
									14	90	46	10	14	10	17	
120	11	[Same]	VII	04	03 36	07	19	87	216	1701	737	05	02	05	04	VI
												05	10	05	16	
												06	11	06	17	
												07	01	07	05	
									>70	>583		05	06	05	16	
												06	11	06	20	
												07	00	07	05	

[1]	[2]	[3]	[4][5][6]	[7][8]	[9]	[10]	[11]	[12]	[13][14]	[15][16]	[17]
120	11	[Same]	VII 04 03 36	07 19	87	213	546	1163	05 10	05 16	VI
						>13	963	275	05 06	05 15	
						78	520	93	05 09	05 18	
						>51	668	>212	05 09	06 01	
121	12	[Same]	VII 20 23	25 14	111	45	162	90	21 18	21 21	M+
						>47	>308		21 05	21 11	
						20	146	98	21 04	21 12	
						17	115	19	21 07	21 12	
						10	88	29	21 04	21 12	
						11	114	44	21 04	21 12	
									21 18	21 21	
122	13	[Same]	VIII 01 18	02 22	28	25	210	161			M+
						43	161		02 13 20	02 17	
						29	147	70	02 13	02 18	
									04 01	04 06	
									04 10	05 03	
						29	130	39	02 14	02 16	
						12	38	23	02 05	02 15	
						11	86	33	02 07	02 16	
123	14	[Same]	VIII 04 01 26	05 05	28	124	987	515	04 11	01 18	VI
									04 20	04 21	
									05 00	05 03	
						>67	>466		04 10	04 18	
						89	383	306			
						31	212	114	04 11	04 15	
						20	131	86	04 03	05 03	
						27	143	96	04 15	04 18	
124	15	[Same]	VIII 26 10	30 15	92	44	257	378	26 17	27 03	M+
									27 13	28 02	
						62	246		27 08	27 16	
									28 10	28 12	
						30	158	157	27 08	28 00	
						29	123	80	27 10	27 15	
						18	61	13	27 02	27 16	
						12	131	59	27 08	27 12	
125	16	[Same]	IX 18 04	21 17	85	>67	>574		18 07	19 08	VI
									19 19	19 20	
									20 10	20 17	
									21 07	21 16	
						242	2000	1227	18 10	19 08	
						98	750	618	18 10	19 10	
						49	261	113	18 11	19 09	
									20 10	20 14	
						46	343	121	18 05	19 21	
126	17	[Same]	X 11 06	12 18	36	>42	209				I
						89	154	111	11 10	12 04	

[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[13][14]	[15][16]	[17]
126	17	[Same]	X	11	06	12	18	36	14	120	46			I
									8 14	120 126	18 36	11 08 11 17	11 17 11 24	
127	18	[Same]	X	22	12	23	00	12	42 33 21	229 154 132	175 14	22 16	22 21	M
									23 10	41 138	13 34	22 15	22 22	
128	19	[Same]	X	31	03 42	01	19	39	49 52 33	475 179 163	179 75	01 05 31 16 31 20	01 17 01 17 31 24	I
									17 14	171 192	15 64	31 17 01 06 31 17	31 24 01 12 01 02	
129	20	[Same]	XI	05	15	11	20	149	47	316		06 07 07 07 08 10 10 13	06 21 07 18 08 16 10 19	I
									43 31	159 94	110 51	06 12 06 11	06 20 06 14	
									11 6	112 45	11 15	06 11	06 15	
130	21	[Same]	XI	16	21	19	13	64	47 45	238 127	87	17 13 18 10 17 13	17 19 18 20 17 22	M+
									15 14	77 122	15 41	17 13 18 10 17 12	17 20 18 19 17 22	
131	22	[Same]	XII	01	06 00	02	19	37	68 85 33	580 199 215	298 72	01 09 01 17 01 09	01 20 02 00 01 19	VI
									16 22	174 223	25 59	01 06 01 06	01 19 01 22	
132	23	[Same]	XII	13	11	15	00	37	38 35	146 78	58			M+
									7 11	79 89	6 19	14 09 14 09	14 16 14 22	
133	1	[Same]	II	05	10	1942 07	02	40	56 32	199 138	75	06 11 05 10 06 11	06 16 05 20 07 02	M
									32	120	39			

[1]	[2]	[3]	[4]	[5][6]	[7][8]	[9]	[10]	[11]	[12]	[13][14]	[15][16]	[17]
133	1	[Same]	II	05 10	07 02	40	13 11	85 105	7 33	06 10 05 10 06 11	06 17 05 19 06 22	M
134	2	[Same]	II	23 13	25 00	35	43 32 22	336 160 152	 156 41	23 14 23 14 23 13	23 23 24 02 23 21	I
							9 10	120 144	7 33	23 14 23 13	23 22 23 24	
135	3	[Same]	II	27 15 24	02 20	77	166 126 107	1386 561 332	 188 105	28 13 01 07 01 03 01 08	28 17 02 04 02 02 01 14	VI
							50 41	231 245	64 72	01 07 01 07	02 04 01 13	
136	4	[Same]	III	03 01	10 21	188	55 53 27	359 176 173	 110 64	05 15 05 16 05 15	05 22 06 00 05 22	I
							15 14	123 127	28 21	05 13 06 08 05 15	05 22 06 14 05 23	
137	5	[Same]	III	13 00	15 19	67	10 31 19	133 146 118	 80 36	13 11 14 13	13 15 14 18	M+
							11 10	100 108	1 51	13 09 14 07 13 08 14 07	13 14 14 15 13 23 14 16	
138	6	[Same]	III	26 06 38	27 00	17	41 23 16	212 123 143	 67 36	26 14	26 18	M
							6 11	127 130	7 49			
139	7	[Same]	IV	02 05	05 15	82	86 69 29	625 193 151	 160 79	02 12 04 10 04 10 04 10 04 16	02 20 04 21 04 21 04 12 04 19	I
							12 19	108 126	7 51	02 12 04 05 04 06	02 20 04 19 04 16	
140	8	[Same]	IV	10 23	11 16	17	47 28 21	268 116 111	 107 61	11 04 11 00	11 15 11 17	I
							12 9	104 127	9 31	11 04 10 23	11 11 11 16	

[1]	[2]	[3]	[4][5][6]	[7][8]	[9]	[10]	[11]	[12]	[13][14]	[15][16]	[17]
141	9	[Same]	IV 13 08 32	14 19	34	38 31 17	190 119 129	87 30			M+
						7 12	138 78	9 25	13 23 13 13 14 09	14 06 14 02 14 18	
142	10	[Same]	IV 16 18	19 20	74	67 33 23	288 165 147	112 64	16 20	17 17	M
						19 13	109 106	23 41	17 02 16 19 18 05	17 16 17 11 18 19	
143	11	[Same]	IV 23 05	24 16	35	4 28 15	86 113 144	58 38	23 12	24 00	M
						3 10	42 136	3 41	23 06	24 03	
144	12	[Same]	VII 08 01	09 04	27	35 28 19	126 113 109	65 165	08 07 08 07	08 11 08 11	M
						8 13	63 89	16 36	08 01	08 20	
145	13	[Same]	VII 11 00	12 20	46	20 28	218 134	95	11 13 12 09	11 17 12 12	M
						no record					
						10 9	121 100	17 72	11 05 11 05 12 09	11 16 11 17 12 22	
146	14	[Same]	VIII 15 10	21 00	134	55	181		16 19 18 06 19 06	16 24 18 15 19 13	M
						23	118	45	16 20 17 11 18 09 19 12 20 10	16 24 17 23 18 15 19 23 20 20	
						20	125	42	18 06 19 08	18 15 19 13	
						4	36	5	18 06 19 08	18 15 19 18	
						11	117	30	15 18 16 18 17 11 18 06 19 09 20 09	15 23 16 22 17 23 18 15 19 23 20 14	

[1]	[2]	[3]	[4]	[5][6]	[7][8]	[9]	[10]	[11]	[12]	[13][14]	[15][16]	[17]
147	15	[Same]	IX	11 11 37	23 00	276	18	124		17 09 19 08 20 10 21 08	17 21 19 17 20 16 21 17	M
							37	211	109	11 16 12 06 21 04	12 00 13 00 21 19	
							22	166	66	12 06 21 09	12 13 21 18	
							18	141	9	12 03 17 10 21 09	12 14 17 16 21 18	
							12	154	38	17 10 18 16 19 11 21 09	17 22 18 21 19 18 21 19	
148	16	[Same]	X	02 02 46	05 00	69	75	434		02 12 04 10 05 08	02 21 04 17 05 15	I
							29	201	134	02 12 03 12 04 05	02 21 04 00 05 00	
							26	155	44	02 12 03 11	02 19 03 20	
							20	107	9	02 05 04 04	02 16 04 14	
							12	138	44	02 09 03 10 04 11	02 22 03 22 04 13	
149	17	[Same]	X	11 15	20 18	219	46	231		13 13 14 10 19 12 20 11	13 18 14 16 19 18 20 17	M
							34	157	109	12 10 13 14 14 11 18 11 19 12	12 19 14 00 14 22 18 21 19 18	
							30	154	40	12 10 13 12 16 12 18 11 19 12	12 13 13 18 16 18 18 19 19 17	
							20	87	9	12 09 19 05 20 11	12 14 19 18 20 17	
							14	114	29	11 18 12 10 13 14 14 14 18 11 19 12 20 11	11 21 12 13 13 18 14 22 18 21 19 18 20 19	

[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[13]	[14]	[15]	[16]	[17]
150	18	[Same]	X	28	11	01	20	105	62	676		28	11	28	19	VI
												29	06	29	20	
												30	08	30	19	
												31	10	31	19	
									53	265	239	28	12	29	01	
												29	10	29	22	
									26	178	79	28	11	28	18	
									14	180	15	28	12	28	23	
												29	05	29	24	
												30	08	30	19	
												31	00	31	01	
									16	187	48	28	13	28	24	
												30	12	30	19	
												31	12	31	19	
151	19	[Same]	XI	23	11	29	19	152	62	319		23	21	24	01	I
												24	08	24	14	
												25	10	25	17	
												26	09	26	18	
									48	148	155	23	15	24	05	
												24	09	24	21	
									41	161	74	24	09	24	13	
												25	10	25	18	
									13	133	8	24	02	24	14	
												25	10	25	16	
												28	12	28	19	
									11							
152	20	[Same]	XII	07	09	12	17	128	31	178		09	13	09	20	M
												11	11	11	15	
												12	09	12	14	
									20	128	76	09	14	10	00	
									4	65	10	07	12	07	17	
												09	13	09	20	
									10	88	18	07	12	07	23	
												08	13	08	22	
												09	13	09	20	
153	21	[Same]	XII	20	17 36	27	00	150	56	327		21	11	21	19	M
												22	10	22	13	
												23	08	23	19	
									35	154	88	21	09	21	22	
												23	07	23	22	
									22	92	35	23	09	23	16	
									10	109	17	21	09	21	19	
												23	08	23	19	
									12	155	34	21	09	21	19	
												23	07	23	20	
												24	09	24	19	
						1943										
154	1	[Same]	I	03	13	06	20	79	61	306		04	11	04	20	M
									45	153	65	04	10	04	19	
									4	154	30	04	11	04	18	

[1]	[2]	[3]	[4]	[5][6]	[7][8]	[9]	[10]	[11]	[12]	[13][14]	[15][16]	[17]
154	1	[Same]	I	08 13	06 20	79	13 13	111 98	18 30	04 10 04 10	04 19 04 19	M
155	2	[Same]	I	16 14	18 20	54	34 32	136 107	66	17 10 17 12	17 20 17 19	M
							7 11	108 101	12 27	17 10 17 10	17 20 17 21	
156	3	[Same]	I	20 06	23 00	66	71 74 6	527 218 123	174 88	20 17 20 16 20 17	20 23 21 09 20 22	I
							21	86	10	20 16 21 06 22 12	20 23 21 15 22 18	
							22	99	26	20 16	20 23	
157	4	[Same]	II	16 17	18 16	47	78 43 39	225 149 166	80 41	17 10 17 00 17 10	17 16 17 16 17 15	M
							16	159	25	no record		
158	5	[Same]	II	25 17	27 00	31	31 28	85 231	53	25 17 25 19 26 16	25 23 26 00 26 20	M
							18	123	24	25 17 26 17	25 20 26 21	
							7	72	13	25 18 26 16	25 22 26 19	
							8	61	27	25 17 26 16	25 21 26 20	
159	6	[Same]	III	04 08	05 23	39	32 20	106 105	49	04 08 04 08 05 16	04 14 04 13 05 22	M+
							12	92	29	04 08	04 14	
							6 6	79 77	8 19	04 08 04 20 05 15	04 14 04 24 05 20	
160	7	[Same]	III	11 15	12 23	32	41 29	119 92	57	11 18 11 20 12 10	12 05 11 22 12 17	M
							14	60	16			
							9 10	79 74	12 23	11 18 12 11	11 23 12 22	
161	8	[Same]	III	19 15	20 21	30	52 23 12	117 146 110	37 34	20 08 20 07 20 15	20 20 20 20 20 20	M+

[1]	[2]	[3]	[4]	[5][6]	[7][8]	[9]	[10]	[11]	[12]	[13][14]	[15][16]	[17]
161	8	[Same]	III	19 15	20 21	30	10	85	12	20 08	20 19	M+
							7	73	26	20 07	20 20	
162	9	[Same]	III	22 07	24 18	59	31	121		23 06	23 13	M
							26	158	75	22 16	23 12	
							20	124	31			
							11	72	12	22 10	23 14	
							10	108	32	22 10	23 13	
163	10	[Same]	III	29 09	30 24	39	63	268		29 18	30 02	M
							44	193	117	29 19	30 02	
							13	193	56	29 18	29 23	
							15	127	27	29 10	29 24	
							14	132	24	29 09	29 23	
164	11	[Same]	IV	02 23 10	08 00	121	40	140		03 03	03 11	M
							29	185	106	03 07	03 19	
										06 03	06 15	
							19	144	41	05 15	05 18	
										06 09	06 16	
							10	78	12	03 00	03 16	
										05 11	05 18	
										06 08	06 15	
							11	127	34	02 23	03 19	
										05 14	06 00	
										06 09	06 16	
165	12	[Same]	IV	10 05	11 22	41	51	314		11 05	11 12	M
							32	148	96	10 10	11 14	
							16	112	58			
							8	70	6	10 07	10 14	
										11 05	11 13	
							8	111	28	10 08	11 12	
166	13	[Same]	IV	20 11	22 10	47	34	76		21 11	21 16	M+
							23	115	48	21 08	21 19	
							15	94	35	21 11	21 20	
							15	49	9			
							11	57	30	21 05	21 20	
167	14	[Same]	IV	28 17	02 19	98	48	332		01 06	01 15	M
							33	176	108	01 05	01 21	
							20	95	64	01 07	01 14	
							15	102	4	30 04	30 14	
										01 06	01 15	
							12	107	39	28 17	28 22	
168	15	[Same]	V	16 04	20 00	90		170		18 04	18 13	M
							23	130	73	17 07	18 05	
										18 09	19 02	
							18	160	34			
							12	76	9	17 20	18 13	
							11	100	39	17 20	18 16	

[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[13]	[14]	[15]	[16]	[17]
169	16	[Same]	VI	07	06	14	14	176	48	234		08	04	08	18	M
									21	153	51	08	04	08	22	
												13	00	13	17	
									14	149	54	08	09	08	13	
									10	105	9	08	03	08	12	
												09	03	09	15	
									10	88	28	08	03	08	19	
170	17	[Same]	VI	19	10	25	19	153	38	149		19	16	20	00	M
												23	14	23	20	
									23	125	74	19	12	20	03	
												22	02	22	17	
												24	00	24	18	
									17	128	35	21	11	21	15	
												24	04	24	11	
									10	77	26	22	03	22	09	
												23	03	23	16	
												24	02	24	11	
									12	89	38	19	11	20	04	
												21	08	21	20	
												23	12	23	21	
												24	05	24	19	
171	18	[Same]	VII	04	05	14	01	236	43	162		05	04	05	24	M
												08	07	08	15	
												10	04	10	15	
									28	194	76	04	10	04	20	
												06	02	06	15	
												09	04	09	20	
												11	04	11	21	
									19	166	90	04	16	04	22	
												06	10	06	17	
												09	07	09	13	
												10	09	10	15	
									15	128	20	04	09	04	13	
												08	04	08	14	
												09	07	09	12	
												10	02	10	14	
												11	05	11	14	
									13	146	38	04	06	05	00	
												08	03	08	15	
												09	03	09	21	
												10	03	10	19	
												11	04	11	14	
172	19	[Same]	VII	30	02	05	21	163	35	162	34	04	10	04	19	M
									25	132	48	02	07	02	16	
												04	00	04	17	
									21	129	46	02	13	02	20	
												04	12	04	18	
									13	88	19	30	02	31	13	
												04	07	04	19	
												05	00	05	10	
									12	86	42	02	07	03	24	
												04	07	04	18	
												05	07	05	21	

[1]	[2]	[3]	[4][5][6]	[7][8]	[9]	[10]	[11]	[12]	[13][14]	[15][16]	[17]
173	20	[Same]	VIII 07 07	09 20	61	56	323	322	07 08	07 16	M+
									08 08	09 15	
						39	186	200	08 10	09 05	
						11	69	32	07 10	07 16	
						16	142	35	07 08	07 16	
									08 04	09 06	
						14	93	46	07 08	07 16	
									08 09	09 05	
174	21	[Same]	VIII 12 15	22 00	225	93	212		13 05	13 15	M
									18 06	18 18	
						40	169	131	17 02	17 08	
									18 00	18 19	
									19 08	19 21	
						34	152	85	13 08	13 14	
									16 10	16 13	
									18 09	18 14	
									19 10	19 14	
						13	128	14	13 05	13 15	
									16 05	16 13	
									18 08	18 14	
									20 01	20 12	
						10	142	34	13 04	13 22	
175	22	[Same]	VIII 23 23	26 21	70	29	85	66	26 06	26 10	M+
						19	126	35	24 05	24 18	
						13	124	12	26 03	26 09	
						7	99	16			
						9	104	23	23 23	24 08	
176	23	[Same]	VIII 28 04	06 12	224	93	298		30 18	30 21	I
						70	309	224	28 10	28 17	
									29 10	29 18	
									30 02	30 17	
									30 21	31 21	
						39	217	113	29 10	29 16	
									30 01	30 05	
									31 06	31 18	
									03 10	03 16	
						30	184	56	28 10	28 18	
									29 10	29 16	
									30 02	30 18	
									31 04	31 18	
						20	144	48	28 10	28 18	
									29 10	29 16	
									30 02	31 21	
									01 12	01 19	
									02 11	02 23	
									03 10	04 00	
									04 06	04 20	
177	24	[Same]	IX 08 07	15 00	161	40	193	116	10 08	10 12	M
						37	172	72	08 17	09 05	
						18	161	39			
						6	125	18	08 18	09 11	

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[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[13]	[14]	[15]	[16]	[17]
177	24	[Same]	IX	08	07	15	00	161				09	14	09	16	M
												14	09	14	14	
									10	112	27	08	18	09	02	
178	25	[Same]	IX	20	12	22	20	56	37	162	46	21	10	21	14	M+
									25	112	41	21	00	21	20	
									12	61	12	21	07	21	14	
									9	63	14	21	07	21	14	
179	26	[Same]	IX	25	04	04	17	205	81	319		29	08	29	20	I
									47	157	203	26	08	26	19	
												29	08	29	22	
												30	05	30	22	
												02	00	02	20	
									40	165	66	29	11	29	20	
												30	10	30	12	
												02	13	02	21	
									27	139	9	26	07	26	17	
												29	07	29	19	
												30	03	30	14	
												01	01	01	15	
												03	06	03	15	
									14	152	46	25	06	25	16	
												26	10	26	22	
												27	09	28	23	
												29	07	29	22	
												30	03	01	02	
												01	04	01	21	
												02	12	02	21	
												03	06	04	00	
180	27	[Same]	X	07	10	11	13	99	58	202	202					M
									31	196	79	08	10	08	17	
												09	00	09	18	
									18	138	33	09	06	09	14	
									10	117	7	08	11	08	17	
												09	04	09	19	
									9	131	29	07	13	07	23	
												08	10	08	20	
												09	03	09	17	
181	28	[Same]	X	22	06	01	19	229	67	434	396	21	10	24	17	I
												26	06	26	16	
												29	09	29	20	
									46	163	114	24	10	24	19	
												26	04	26	17	
												28	03	28	19	
												31	09	31	15	
									31	185	55	24	09	24	18	
												25	10	25	14	
												26	10	26	15	
												29	11	29	16	
												30	11	30	15	
									12	184	22	24	09	24	17	
												25	06	25	14	

[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[13]	[14]	[15]	[16]	[17]
177	24	[Same]	IX	08	07	15	00	161				09	14	09	16	M
												14	09	14	14	
									10	112	27	08	18	09	02	
178	25	[Same]	IX	20	12	22	20	56	37	162	46	21	10	21	14	M+
									25	112	41	21	00	21	20	
									12	61	12	21	07	21	14	
									9	63	14	21	07	21	14	
179	26	[Same]	IX	25	04	04	17	205	81	319		29	08	29	20	I
									47	157	203	26	08	26	19	
												29	08	29	22	
												30	05	30	22	
												02	00	02	20	
									40	165	66	29	11	29	20	
												30	10	30	12	
												02	13	02	21	
									27	139	9	26	07	26	17	
												29	07	29	19	
												30	03	30	14	
												01	01	01	15	
												03	06	03	15	
									14	152	46	25	06	25	16	
												26	10	26	22	
												27	09	28	23	
												29	07	29	22	
												30	03	01	02	
												01	04	01	21	
												02	12	02	21	
												03	06	04	00	
180	27	[Same]	X	07	10	11	13	99	58	202	202					M
									31	196	79	08	10	08	17	
												09	00	09	18	
									18	138	33	09	06	09	14	
									10	117	7	08	11	08	17	
												09	04	09	19	
									9	131	29	07	13	07	23	
												08	10	08	20	
												09	03	09	17	
181	28	[Same]	X	22	06	01	19	229	67	434	396	24	10	24	17	I
												26	06	26	16	
												29	09	29	20	
									46	163	114	24	10	24	19	
												26	04	26	17	
												28	03	28	19	
												31	09	31	15	
									31	185	55	24	09	24	18	
												25	10	25	14	
												26	10	26	15	
												29	11	29	16	
												30	11	30	15	
									12	184	22	24	09	24	17	
												25	06	25	14	

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[1]	[2]	[3]	[4][5][6]	[7][8]	[9]	[10]	[11]	[12]	[13][14]	[15][16]	[17]
181	28	[Same]	X 22 06	01 19	229	15	137	49	26 05 27 06 28 01 29 11 24 09 25 09 26 08 27 16 28 12 29 09 30 11	26 15 27 11 28 16 29 13 24 18 25 21 26 18 27 23 28 21 29 21 30 20	I
182	29	[Same]	XI 06 11	07 10	23	54 44 25	298 216 142	256 68 33	06 14 06 14 06 16	06 19 06 20 06 18	M
						11	113	35	no record 06 14	06 20	
183	30	[Same]	XI 19 02	29 21	269	86 65	298 173	277 130	19—27 06 19 08 24 12 26 12	19—27 18 19 16 24 21 26 20	M
						47	181	71	19 08 20 10 21 09 24 12 26 14	19 19 20 17 21 18 24 14 26 18	
						28	211	14	19 06 20 05 21 08 25 10 27 02	19 14 20 17 21 17 25 22 27 15	
						25	148	40	19 08 20 10 21 08 22 12 23 12 24 13 25 11 26 13 27 10 28 08 28 18 29 14	19 18 20 21 21 20 22 18 23 23 24 20 25 20 26 18 27 14 28 11 28 20 29 21	
184	31	[Same]	XII 02 15	05 17	74	32 29	223 177	115 105	03 13 02 15	03 20 02 21	M
						6 9	64 89	3 22	02 15 03 13	02 21 03 20	
185	32	[Same]	XII 16 06	04 00	186	74 46	276 177	353 105	16 12 17 10 16 07 17 10	16 20 17 19 16 19 18 21	M

[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[13]	[14]	[15]	[16]	[17]
185	32	[Same]	XII	16	06	04	00	186	36	151	49	16	12	16	16	M
												19	10	19	14	
									20	180	12	16	07	16	19	
												17	09	17	14	
												19	07	19	19	
												20	10	20	20	
									15	130	26	16	07	16	21	
												17	10	17	18	
												19	10	19	19	
												20	10	21	00	
186	33	[Same]	XII	26	10	26	22	12	31	113	44					M
									20	122	36	26	11	26	16	
									7	64	9					
									6	73	19	26	10	26	22	
187	34	[Same]	XII	30	13	01	23	58	20	153	118					M*
									45	128	67	01	14	01	17	
									6	69	6					
									13	93	19	31	08	31	24	
												01	13	01	22	
						1944										
188	1	[Same]	I	10	22	19	00	194	58	345	195	11	14	11	20	M*
												12	11	12	18	
												14	11	14	18	
									45	154	59	11	16	11	21	
												12	12	12	18	
												14	14	14	19	
									28	123	31	10	22	10	24	
												11	15	11	19	
									14	96	9	11	14	11	18	
												12	11	12	16	
												13	07	13	14	
												14	10	14	19	
									15	100	30	11	15	11	20	
												12	11	12	19	
												13	00	13	21	
												14	10	14	19	
												15	15	15	24	
												16	09	16	18	
												17	11	17	21	
												18	09	18	21	
189	2	[Same]	II	07	06	16	17	227	58	202	286	07	10	07	20	M
									50	154	131	07	12	08	00	
												08	12	08	22	
												09	12	09	20	
									38	164	63	07	12	07	17	
												14	08	14	15	

[1]	[2]	[3]	[4][5][6]	[7][8]	[9][10]	[11]	[12]	[13]	[14][15]	[16]	[17]
189	2	[Same]	II 07 06	16 17	227	30	194	12	07 09 11 08 14 05	07 19 11 16 14 16	M
						13	155	40	07 12 08 13 09 06 10 10 11 09 13 23	07 20 08 22 09 20 10 19 11 16 14 15	
190	3	[Same]	III 04 02 41	14 16	253	60	257	86	07 06 10 07	07 16 10 19	M
						74	179	81	07 09 10 07	07 16 10 20	
						22	127	28	07 11 10 01	07 16 10 19	
						13	105	9	04 07 06 09 10 07	04 14 06 16 10 15	
						15	104	40	04 07 07 12 09 11 10 07 13 12	04 17 07 17 09 20 10 19 13 17	
191	4	[Same]	III 18 17	20 00	31	47 35 19	154 147 147	88 69 38	18 18 18 20 18 18	19 04 19 04 19 03	M
						13 9	123 94	9 23	18 18	19 04	
192	5	[Same]	III 25 10	27 21	59	66	305	189	26 10 26 23	26 15 27 12	I
						40 30	179 192	94 43	27 00 26 23	27 14 27 06	
						20 13	180 121	23 37	26 03 26 06 26 23	27 13 26 15 27 13	
193	6	[Same]	IV 01 16	07 00	128	156 52	360 221	336 234	02 04 02 09 05 09	02 15 02 14 05 20	VI
						31	255	225	02 07	02 14	
						28	323	63	02 05 04 05 06 05	02 14 04 12 06 14	
						13	247	64	02 05 04 05 05 07 06 06	03 09 04 18 05 20 06 20	
194	7	[Same]	IV 15 13	17 00	35	47 32 26	206 121 113	230 86 46	16 08 16 08 16 12	16 18 16 18 16 18	M

[1][2]		[3]	[4][5][6]	[7][8]	[9]	[10]	[11]	[12]	[13][14]	[15][16]	[17]
194	7	[Same]	IV 15 13	17 00	35	10 10	95 131	8 31	16 06 16 11	16 17 16 19	M
195	8		V 01 04	08 09	173	38 38 20	266 179 173	319 82 43	01 11 01 12 01 14	01 18 02 00 01 17	
						14	138	5	01 10 02 05	01 18 02 14	
						13	109	33	01 10 02 05 03 12 04 12 05 10 06 11	01 24 02 07 03 16 04 22 05 16 06 19	
196	9	[Same]	VIII 02 02 28	03 15	17	53 31 22	159 150 180	129 88 48	02 19 03 02	03 05 03 05	M
						18 10	77 127	11 37	02 11 03 02	02 19 03 14	
197	10	[Same]	X 10 19	11 20	25	17 22	148 102	84 104	11 00	11 05	M+
						4 8	159 127	4 35	11 14	11 18	
198	11	[Same]	X 13 13	16 00	59	20 38	116 154	90 121	14 19	15 05	M+
						6	93	7			
199	12	[Same]	X 23 15	25 00	33	35 34	142 73	118 57	23 15 23 20	23 21 24 00	M
						8	68	7			
200	13	[Same]	XI 20 05	21 00	19	33 30	163 117	185 47	20 12	20 20	M+
						9	57	3			
201	14	[Same]	XII 13 08	14 16	32	44 41	129 75	120 29	13 15 13 10	13 19 13 20	M+
						5	99	6			

[1]	[2]	[3]	[4][5][6]	[7][8]	[9]	[10]	[11]	[12]	[13][14]	[15][16]	[17]
202	15	[Same]	XII 15 18 50	18 18	71	80 101 49	644 367 288	409 445 86	17 09 16 06 16 13 17 09	17 19 16 20 16 19 17 20	VI
						25	319	60	16 13 17 09	16 20 17 24	
						35	277	63	16 04 17 09	16 19 17 23	
203	16	[Same]	XII 26 10 22	28 18	56	68 49 34	380 131 156	329 140 45	27 13 27 12 27 11	27 21 28 02 27 21	M
						10 22	113 151	6 37	27 11	28 11	
				1945 г.							
204	1	[Same]	I 09 15	10 19	28	32 26 22	146 107 126	48 70 29	10 09 10 00	10 15 10 18	M
						9 11	99 100	3 20	10 06 09 15	10 15 10 19	
205	2	[Same]	I 15 02	15 21	19	48 34 19	420 112 137	279 68 39	15 11 15 14 15 15	15 20 15 21 15 19	M+
						11 12	71 113	10 32	15 11	15 19	
206	3	[Same]	I 28 17	30 17	42	43 35 25	137 151 134	290 74 31	28 23 29 00	29 09 29 05	M+
									no record		
						14	97	28	28 18 29 14	29 05 29 21	
207	4	[Same]	II 14 21	17 22	73	44 23	167 123	89 41	15 10 16 14	15 21 16 21	M+
						10 7	59 84	13 22	17 11	17 21	
208	5	[Same]	II 26 15	27 21	30	37 38	116 112	151 50	26 15 26 15	26 23 26 22	M
						10 12	60 74	10 16	26 15 27 12	26 22 27 21	
209	6	[Same]	III 05 14	07 00	34	30 41	142 103	176 59	05 16 05 16	05 23 06 00	M+

[1]	[2]	[3]	[4]	[5][6]	[7][8]	[9]	[10]	[11]	[12]	[13][14]	[15][16]	[17]
209	6	[Same]	III	05 14	07 00	34	07	50	10			M+
							15	85	22	05 14	05 22	
										06 14	06 20	
210	7	[Same]	III	08 03	08 18	15	46	154	112	08 11	08 17	M
							31	54	24	08 10	08 17	
							11	79	15			
							10	71	6			
							10	68	17	08 10	08 17	
211	8	[Same]	III	10 23	13 01	50	72	362	273	11 10	11 19	M+
										12 10	12 23	
							47	137	120	12 10	12 22	
							23	105	58	12 10	12 15	
							17	90	10	11 09	11 17	
										12 10	12 16	
							12	100	30	10 23	11 19	
										12 10	12 24	
212	9	[Same]	III	14 23	17 00	49	40	208	154	15 14	15 22	M
							44	174	99	15 14	16 00	
							27	168	39	15 15	15 18	
							13	178	13	15 12	15 23	
							16	102	26	15 00	15 23	
										16 10	16 19	
213	10	[Same]	III	25 16	28 21	77	95	247	355	26 08	26 20	I
										28 07	28 15	
							54	207	106	28 00	28 16	
							26	167	44	28 10	28 15	
							26	172	13	26 06	26 20	
							16	148	50	26 05	26 20	
										28 04	28 15	
214	11	[Same]	IV	01 05 00	02 00	19	92	684	474	01 07	01 14	M
							36	112	121	01 09	01 20	
							29	123	88	01 09	01 14	
							13	162	11	01 06	01 17	
							11	136	57	01 08	01 17	
215	12	[Same]	IV	05 19	08 18	71	42	159	196	06 08	06 18	M+
							21	151	74	06 05	06 19	
							16	75	24			
							8	54	9			
							12	89	33	06 07	06 18	
										07 02	07 08	
										07 22	08 17	
216	13	[Same]	IV	11 07 27	13 13	54	54	253	174	11 10	11 16	M+
							38	183	135	11 09	11 14	
							28	154	60	11 09	11 12	
							13	109	6	11 08	11 16	
							17	195	34	11 08	11 14	

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[1]	[2]	[3]	[4][5][6]	[7][8]	[9][10]	[11]	[12]	[13]	[14]	[15][16]	[17]
217	14	[Same]	VIII 27 22	28 22	24	28 29	142 152	25 55	28 02	28 05	M+
							no record				
						9	113	19	28 01	28 05	
218	15	[Same]	IX 16 23	19 02	51	42 54	431 140	298 99	18 10 17 08 18 10	18 21 18 00 19 02	I
						20	102	52	17 09 18 10	17 14 18 19	
						11 16	71 107	3 25	17 00 18 07	17 22 19 02	
219	16	[Same]	X 12 08	12 20	12	44 38 23	455 106 116	342 88 30	12 12 12 10 12 13	12 19 12 16 12 16	M
						6 14	82 116	3 30	12 10	12 20	
220	17	[Same]	X 24 02	25 20	42	72	240	223	24 10 25 09	24 12 25 17	I
						41	162	105	24 10 24 17	24 15 25 04	
						27	169	58	24 10	24 13	
						10 13	71 141	15 42	24 09 25 09	25 01 25 20	
221	18	[Same]	XI 08 15	10 00	33	54 33 19	210 135 135	248 63 29	09 09 09 10	09 17 09 22	M+
						8 8	75 155	21 28	08 16 09 06	08 21 09 20	
222	19	[Same]	XII 13 12 37	14 18	29	131 56 35	970 156 257	588 207 106	14 07 14 09 14 09	14 15 14 16 14 15	M
						17 17	137 200	64	13 16 14 05	14 03 14 16	
223	20	[Same]	XII 19 18 11	21 00	30	38 34	142 96	25 48	19 22 20 18	20 13 21 05	M+
						30	104	31			
						8 11	37 80	14 30	19 18	21 04	
224	21	[Same]	XII 25 07	29 00	89	48 41	214 133	193 42	25 12 25 12	25 19 25 20	M

[1]	[2]	[3]	[4]	[5][6]	[7][8]	[9]	[10]	[11]	[12]	[13][14]	[15][16]	[17]
224	21	[Same]	XII	25 07	29 00	89	22	92	34	27 10	28 00	M
							3 12	48 85	6 27	25 07 27 11 28 13	26 22 27 20 28 17	
					1946							
225	1	[Same]	I	03 08 10	04 23	39	130 108 46	779 265 192	565 288 106	03 11 03 10 03 12	03 23 04 00 03 24	VI
							14 34	138 249	42 65	04 10 03 08 04 07	04 21 04 01 04 20	
226	2	[Same]	I	23 20	26 20	70	61 45 36	176 126 116	144 85 34	24 10 24 12 24 13	24 17 24 21 24 17	M*
							12 17	50 89	25	24 10	24 20	
227	3	[Same]	II	07 08	08 21	37	82 85 90	496 688 354	504 661 157	07 10 07 09 07 19	08 18 08 17 08 03	VI
								no record				
							22	200	95	07 10	08 16	
228	4	[Same]	II	14 07	15 21	38	47 18 17	176 103 95	146 47 18	[illegible] 14 17	14 11 15 05	M*
							8 12	50 90	18 37	14 17 14 18	14 11 14 22	
229	5	[Same]	II	19 01	21 19	66	41 36	616 128	414 176	21 12 19 15 20 19 21 13	21 18 19 21 21 04 21 19	M
							28	132	100	21 05	21 19	
							11	99	6	19 04 21 08	19 10 21 19	
							12	152	39	20 21	21 18	
230	6	[Same]	III	09 12	11 23	59	51 35	197 145	188 131	10 13 10 13	10 22 11 00	M
							11	84	27	09 16 10 08	09 21 10 23	
							9	102	53	09 12	10 01	
231	7	[Same]	III	22 05 38	26 21	111	63	367	674	24 09 25 07	24 18 26 01	VI

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[1]	[2]	[3]	[4][5][6]	[7][8]	[9][10]	[11]	[12]	[13]	[14]	[15][16]	[17]
231	7	[Same]	III 22 05 38	26 21	111	125	711	734	23 22 25 12	24 08 26 00	VI
						61	314	251	23 22 24 12 25 18	24 04 24 16 25 22	
						23	132	48	24 10 25 08	24 17 25 22	
						29	212	101	22 06 23 17	22 15 24 08	
232	8	[Same]	III 27 14	29 17	51	146 217 140	1042 1116 926	630 957 624	28 08 28 07 28 09	28 24 29 05 28 22	VI
						83 55	559 215	120 200	29 07 28 07	30 01 28 21	
233	9	[Same]	IV 09 04	10 02	22	40 31	305 81	302 89	09 13 09 09	09 17 09 16	M
						3 10	121 95	22 59	09 08	09 18	
234	10	[Same]	IV 12 19 17	15 20	73	83	416	430	14 12 15 06	14 15 15 19	M
						33	198	161	14 10 15 02	14 17 15 16	
						25	66	37	15 12	15 17	
						10 12	94 131	46	15 01 15 06	15 07- 15 16	
235	11	[Same]	IV 22 07 03	25 07	72	100 80	798 646	755 705	23 08 23 10 23 22	24 19 23 20 24 18	VI
						31	285	204	23 15	24 08	
						28 21	226 212	60 63	23 09 23 08 23 22	24 08 23 19 24 12	
236	12	[Same]	V 05 20	07 17	45	19 30 22	156 243 218	225 98 60	07 04 06 22 06 22	07 13 07 08 06 24	M
						no data					
						13	185	56	06 04 06 22	06 11 07 09	
237	13	[Same]	V 08 03	10 00	45	28 19	233 124	224 85	08 03 09 12	08 14 09 19	M
						25	132	44	08 12	08 14	
						no data					

[1]	[2]	[3]	[4][5][6]	[7][8]	[9]	[10]	[11]	[12]	[13][14]	[15][16]	[17]
238	14	[Same]	V 10 22	11 22	24	54	335	290	11 04	11 11	M
						23	120	36	10 22	11 05	
									11 07	11 19	
						17	141	65	11 08	11 10	
								no data			
						11	135	39	11 06	11 18	
239	15	[Same]	V 20 21	25 11	110	32	261	300	22 06	22 11	M
						30	238	90	22 04	22 12	
						25	243	80	22 04	22 11	
								no data			
						14	159	46	22 03	22 21	
									23 10	23 20	
240	16	[Same]	V! 07 07 40	09 15	55	56	333	230	07 08	07 18	M
						38	171	95	07 08	07 18	
									08 04	09 02	
						16	162	36	07 09	07 15	
						7	59	6	07 09	—	
									08 10	08 17	
						14	106	34	07 08	07 21	
									08 06	09 04	
241	17	[Same]	VI 27 17 30	29 23	54	43	302	245	29 13	29 22	M
						36	127	100	29 14	29 21	
						25	109	59	29 07	29 10	
						7	31	2	29 04	29 15	
						17	91	47	28 04	28 21	
									29 02	29 22	
242	18	[Same]	VII 07 03 19	08 18	39	26	202	138	07 19	08 01	M
						33	126	55	08 04	08 07	
						20	164	46	07 05	07 12	
						12	94	24			
						14	121	32	07 06	07 12	
									08 14	08 17	
243	19	[Same]	VII 18 09 03	19 15	30	45	225	160	18 14	18 20	M
						29	177	63	18 16	19 02	
									19 10	19 14	
						18	175	42	18 09	18 19	
								no data			
						12	120	36	18 14	18 19	
244	20	[Same]	VII 26 18 46	27 22	27		386	405	26 19	26 24	VI
									27 03	27 10	
						138	810	369	26 19	27 07	
						66	783	182	26 19	27 01	
						33	342	7	26 19	27 20	
						39	240	91	26 19	27 08	
245	21	[Same]	VII 28 17	30 18	49			no data			M
						34	278	54	29 07	29 08	

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[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[13]	[14]	[15]	[16]	[17]
245	21	[Same]	VII	28	17	30	18	49				30	00	30	14	M
									25	221	56	29	16	29	19	
									7	118	2					
									15	120	37	29	16	29	20	
246	22	[Same]	VIII	14	01	17	00	71			220	14	10	14	14	M+
									27	134	105	14	10	14	14	
												14	18	15	20	
										no data				17	00	
									17	84	57	14	10	14	13	
										no data						
									14	105	50	14	07	14	13	
247	23	[Same]	VIII	30	22 41	31	18	19	36	130	108					M+
									21	187	61	30	23	31	07	
									22	162	36					
									9		9					
									7	143	32	31	01	31	07	
248	24	[Same]	IX	16	13 48	17	08	18	59	421	330	16	16	16	22	M
									40	159	90	16	17	16	21	
									18	152	44	16	17	16	21	
									9	125	5	16	14	16	20	
									11	116	20	16	17	16	24	
249	25	[Same]	IX	17	23 50	19	20	44		86	430	18	03	18	14	I
												19	13	19	17	
									78	348	388	18	12	18	20	
												19	10	19	16	
									41	253	125	18	08	18	20	
												19	10	19	15	
									14	99	9	18	12	18	20	
									16	245	36	18	06	18	20	
												19	04	19	16	
250	26	[Same]	IX	21	17 13	24	17	72				23	13	23	23	VI
									165	1241	451	22	10	22	19	
									106	624	230	22	04	22	20	
									35	213	20	22	04	22	17	
									49	230	139	22	04	23	01	
251	27	[Same]	IX	27	00	30	21	91	64	232	390	27	16	27	22	I
												28	05	28	17	
									75	254	300	28	12	29	02	
									51	180	99	28	15	28	19	
									12	151	7					
									18	165	61	27	17	27	23	
												28	12	29	02	
252	28	[Same]	X	25	17	28	00	55		no data						M
									44	174	157	26	21	27	04	
												27	09	27	19	
									31	121	72	27	09	27	17	

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[1]	[2]	[3]	[4]	[5][6]	[7][8]	[9]	[10]	[11]	[12]	[13][14]	[15][16]	[17]
252	28	[Same]	X	25 17	28 00	55	17 12	79 134	8 39	27 02 26 22 27 08	27 17 27 05 27 17	M
253	29	[Same]	XI	24 03 48	26 06	50	37	298	130	24 10 25 12	24 16 25 17	M
							30	144	55	24 10 25 12	24 16 25 21	
							5 7	67 171	6 36	25 17 24 11	25 21 24 18	
254	30	[Same]	XII	19 00	19 20	20	16 29	191 107	240 60	19 12	19 19	M
							16	92	7			
					1947							
255	1	[Same]	I	04 11 20	06 23	60	16 60	151 282	77 128	05 16 04 11 05 16 06 11 05 14	05 21 04 17 05 20 06 13 05 19	M
							35 20	194 119	55 27			
							9	80	18	04 12 05 12	04 21 05 20	
							64	117	28	04 11 05 06 06 12	04 20 05 20 06 16	
256	2	[Same]	I	16 03 36	17 12	32	52 31	167 211	83 232	16 16 16 03 16 16	16 22 16 05 16 22	M
							40 25	118 179	68 35	16 16 16 04	16 22 16 07	
							8 12	141 132	16 30	16 03 16 16 18 15	16 07 16 22 18 19	
257	3	[Same]	I	24 06	28 00	90	62 18	130 453	215 491	25 13 25 08 26 12	25 20 25 20 26 19	M
							40	163	90	25 12 26 14	25 16 26 17	
							29	184	64	25 12	25 16	
							12	183	43	24 07 25 05	24 11 25 16	
							12	168	51	24 06 24 23	24 09 25 20	

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[1]	[2]	[3]	[4]	[5][6]	[7][8]	[9]	[10]	[11]	[12]	[13][14]	[15][16]	[17]
258	4	[Same]	II	08 08	10 18	58	47	164	222	08 15	08 23	M+
							44	225	233	08 11	08 20	
							32	94	86	08 13	08 20	
							24	84	28			
							9	85	11	08 11	08 19	
							9	116	33	08 09	08 24	
										09 19	09 24	
259	5	[Same]	II	16 03 00	17 20	41	94	292	366	16 12	16 18	I
							54	480	364	16 11	16 19	
							60	179	222	16 12	16 18	
										17 00	17 04	
										17 14	17 18	
							29	246	95	16 10	16 17	
							14	215	49	16 08	16 18	
							15	228	87	16 08	16 17	
260	6	[Same]	III	02 04 01	05 10	78	82	319	507	02 08	02 12	VI
							86	1072	809	02 12	02 23	
										03 08	03 24	
							57	314	496	02 07	02 12	
										03 07	03 08	
										03 09	04 01	
							55	363	220	02 13	02 16	
										03 09	03 24	
										04 08	04 10	
							33	271	78	02 08	03 03	
										03 06	04 00	
							28	273	101	02 07	03 11	
										04 17	04 19	
261	7	[Same]	III	07 05 35	09 22	64	105	650	484	08 12	08 22	I
							86	359	568	08 10	08 22	
							71	267	314	08 12	08 22	
							39	152	141	08 13	08 21	
							20	148	52	08 09	08 22	
							20	192	89	08 06	09 20	
262	8	[Same]	III	15 08	16 00	16	60	517	377	15 10	15 17	I
							130	413	476	15 08	15 17	
							46	248	311	15 08	15 13	
							36	148	78	15 08	15 17	
							17	112	21			
							12	161	69	15 09	15 17	
263	9	[Same]	III	22 03	24 11	56	43	157	153			M+
							44	276	236	23 14	23 19	
							37	123	43	23 09	23 17	
								no data				
							13	103	28	23 10	23 18	

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[1]	[2]	[3]	[4]	[5][6]	[7][8]	[9]	[10]	[11]	[12]	[13][14]	[15][16]	[17]
264	10	[Same]	III	27 04 30	29 00	44	48	341	376	28 02 28 12	28 05 28 23	M
							64	607	430	28 07	28 18	
							39	208	147	28 12 30 06	28 20 30 08	
							22	111	69			
								no data				
							14	138	72	27 05 28 00	27 13 28 24	
265	11	[Same]	IV	08 21 50	09 23	25	28	162	287			M
							54	304	210	09 06	09 13	
							29	141	84	08 22	09 05	
							23	148	70			
							19	99	20			
							14	120	40	08 22	09 14	
266	12	[Same]	IV	17 12 24	21 09	93	186	764	771	17 19	17 23	VI
							85	527	474	17 18 18 12	17 23 18 20	
							188	885	586	17 20	18 00	
							47	452	193	17 18	17 23	
							25	344	63	17 13	18 02	
							39	181	78	17 12	19 20	
267	13	[Same]	V	15 00	17 00	48	27	202	183			M+
							15	168	100	15 03	15 11	
							26	171	75	15 08 16 04	15 16 16 14	
							22	136	38			
							15	113	51	15 05	15 23	
268	14	[Same]	V	22 22 45	24 17	43	69	234	127	23 03 24 06	23 07 24 11	M
							>79	782	358	23 03 24 06	23 07 24 12	
							35	277	66	24 05	24 10	
							29	147	152			
							21	291	30	23 03 24 07	23 07 24 11	
							19	212	50	22 23 24 01	23 19 24 16	
269	15	[Same]	VI	05 07 30	06 02	19	37	208	190	05 10 05 23	05 12 06 01	M
							29	199	115	05 07	05 11	
							25	144	62	05 07 05 18	05 09 06 02	
							26	168	27	05 08	05 11	
							16	123	44	05 07 05 20	05 19 05 27	

[1]	[2]	[3]	[4]	[5][6]	[7][8]	[9]	[10]	[11]	[12]	[13][14]	[15][16]	[17]
270	16	[Same]	VI	13 17	15 00	31	44	328	241	13 23	14 05	M
										14 09	14 11	
							39	449	241	14 00	14 12	
							46	271	107	14 00	14 05	
							29	245	76	14 02	14 04	
										14 07	14 11	
							20	170	40	13 21	14 11	
							21	160	49	14 00	14 22	
271	17	[Same]	VI	17 03	18 12	33	29	197	138			M+
							23	151	195			
							25	148	59	17 10	17 19	
							13	115	64			
							13	65	49	17 03	17 24	
272	18	[Same]	VII	17 17 48	20 21	76	95	914	640	17 18	18 01	I
										18 11	18 19	
					-		40	415	375	18 03	18 20	
							62	363	217	17 18	17 22	
										18 02	18 10	
							37	399	70	17 18	17 21	
							28	194	38			
							24	244	56	17 18	18 19	
										19 04	19 15	
273	19	[Same]	VIII	12 00	14 19	67	37	267	47	12 00	12 13	M+
										13 11	14 02	
							20	216	202	12 06	12 11	
							27	164	50	12 07	12 11	
										13 12	13 20	
274	20	[Same]	VIII	15 09 49	25 18	148	104	415	398	15 20	16 02	I
										16 11	16 16	
										17 12	18 03	
										19 11	20 03	
							86	581	374	15 20	16 01	
										17 06	17 21	
										19 06	19 24	
										22 09	22 18	
										23 13	23 19	
							77	345	245	15 10	16 00	
										19 18	20 00	
										22 09	22 13	
										22 16	22 19	
							30	318	73	15 21	15 24	
										22 09	22 13	
									no data			
							27	219	89	15 21	16 20	
										17 09	18 03	
										19 15	19 23	
										22 09	22 17	
										23 09	23 07	

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[1]	[2]	[3]	[4]	[5][6]	[7][8]	[9]	[10]	[11]	[12]	[13][14]	[15][16]	[17]
275	21	[Same]	IX	02 23 26	04 20	45	36	290	322	03 06	03 15	I
										03 19	03 24	
							204	363	626	03 06	03 20	
							47	298	118	03 10	03 12	
							41	402	102	03 07	03 11	
							22	312	44	03 06	03 20	
							19	231	54	03 06	03 22	
										04 05	04 09	
										04 14	04 20	
276	22	[Same]	IX	06 13	08 10	45	53	348	262	07 18	07 22	M
							42	225	282	06 16	06 21	
										07 15	07 22	
							44	202	209	06 19	06 21	
										07 15	07 20	
							22	158	45	08 07	08 09	
							13	126	19	07 14	07 22	
							16	114	33	06 16	06 21	
										07 19	07 22	
										08 01	08 10	
277	23	[Same]	IX	13 05	20 00	168	25	323	341	13 10	13 14	M
										[illegible]	14 18	
										[illegible]	[illegible] 17	
										[illegible]	[illegible] 22	
							27	[illegible]	[illegible]	[illegible]	[illegible] 14	
										14 07	14 18	
										15 07	15 22	
							45	202	209	13 10	13 13	
										14 16	14 19	
							33	130	81			
							18	156	29	13 08	13 13	
										14 07	14 17	
										15 08	15 18	
										17 11	17 19	
							16	145	32	15 07	15 21	
278	24	[Same]	IX	22 07	23 14	34	30	237	163			M
							66	186	320	22 06	22 17	
							24	142	95	23 10	23 13	
							20	118	58			
							10	91	37	22 16	23 01	
										23 04	23 13	
279	25	[Same]	IX	24 00	26 00	48	87	917	555	24 14	25 04	VI
							91	691	796	24 12	24 23	
										25 03	25 13	
							65	341	326	24 14	25 00	
										25 16	25 19	
							38	248	125	24 14	24 21	
							26	194	54	24 11	24 22	
							18	238	39	24 15	24 24	
										25 11	25 21	

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[1]	[2]	[3]	[4][5][6]	[7][8]	[9]	[10]	[11]	[12]	[13][14]	[15][16]	[17]
280	26	[Same]	IX 30 18 10	03 15	69	44	555	304	02 12	03 05	I
						70	410	403	02 14	02 24	
						45	136	174	02 14	02 22	
						29	184	70	02 14	02 19	
									02 21	03 01	
						23	156	41	02 14	02 23	
						17	120	55	01 04	01 12	
									02 01	03 01	
281	27	[Same]	X 09 06	16 17	169	53	250	255	10 20	10 23	M
									11 19	12 03	
									12 18	12 21	
						59	767	525	09 11	09 20	
									12 11	12 21	
									15 11	15 19	
						51	196	163	09 12	09 19	
									10 16	10 18	
						27	176	71			
						14	132	40	10 09	10 21	
									11 15	11 17	
									12 12	12 21	
282	28	[Same]	XI 08 10	12 10	96	98	692	591	09 20	10 03	I
									10 21	11 03	
									11 13	11 18	
						96	282	594	09 12	09 21	
									11 12	11 19	
						47	221	248	09 18	09 22	
									11 12	11 18	
						44	176	97	09 12	09 24	
						18	151	20	09 12	10 01	
									11 13	11 19	
						16	185	49	09 11	09 21	
									10 16	10 22	
283	29	[Same]	XII 06 09	06 23	15	36	128	200	06 18	06 23	M
						37	173	204	06 12	06 19	
						38	114	65	06 18	06 22	
						12	85	12	06 12	06 20	
						14	116	24	05 23	06 24	
				1948							
284	1	[Same]	I 03 04	03 22	18	93	430	350	03 15	03 20	I
						39	523	374	03 12	03 21	
						52	144	155	03 14	03 20	
						14	143	48	03 15	03 20	
						4	102	18	03 10	03 20	
						16	162	34	03 11	03 20	

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285	2	[Same]	I	17 08	17 22	14	42	157	202	17 13	17 15	M
										17 19	17 21	
							30	220	236	17 12	17 18	
							29	126	87	17 13	17 22	
							16	155	28	17 13	17 16	
							4	129	9	17 09	17 18	
							9	148	121	17 12	17 21	
286	3	[Same]	II	03 02 07	04 01	23	37	220	118	03 12	03 14	M
							69	122	56	03 08	03 14	
							26	121	76	03 07	03 14	
							15	157	75	03 11	03 14	
							8	130	25	03 02	04 01	
							8	186	32	03 06	03 14	
287	4	[Same]	II	14 09	18 19	106	37	134	175	15 19	16 03	M
							45	134	246	15 10	15 15	
										16 08	16 18	
							39	108	58	15 14	15 20	
							13	140	41	15 11	15 15	
										15 19	15 22	
							14	113	25	15 10	15 23	
										16 08	16 18	
							13	126	28	15 07	15 24	
										16 12	16 18	
288	5	[Same]	II	23 08	24 22	38	56	145	142	23 11	23 13	M
							50	181	236			
							44	131	86	23 10	23 19	
										24 18	24 21	
							16	107	27			
							15	127	41	23 09	23 18	
										24 18	24 21	
289	6	[Same]	III	01 00	04 00	72	37	209	188	01 19	01 24	M
							50	134	36	02 09	02 12	
							23	123	77	01 07	01 15	
							23	102	36			
							8	120	30	01 06	01 15	
										02 10	02 21	
290	7	[Same]	III	11 21 37	16 03	101	43	626	430	15 04	15 20	I
							122	1123	754	13 08	13 20	
										15 05	15 20	
							46	233	272	15 00	15 06	
										15 16	15 20	
							32	230	117	15 11	15 20	
							21	204	57	13 09	13 23	
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										15 03	15 20	

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							34	144	58	06 17	07 03	
291	8	[Same]	IV	06 03 57	08 00	44	26	147	78	06 17	06 22	M
							24	138	41	06 17	06 20	
							19	159	32	06 18	06 22	
							11	110	22	06 17	07 03	
							11	103	48	06 17	06 22	
							110	215	446	21 00	21 05	M
292	9	[Same]	IV	20 22	22 20	46	121	298	211	21 00	21 02	
							34	148	132	21 00	21 02	
							22	142	44	21 01	21 12	
										22 02	22 14	
							15	133	64	21 00	21 12	
							36	204	181	07 06	07 14	M
293	10	[Same]	V	07 06 08	09 18	60	38	333	394	07 06	07 13	
										09 07	09 18	
							33	149	94	07 07	07 20	
										09 07	09 18	
							20	111	55	09 08	09 11	
							13	100	42	07 06	07 14	
							12	146	61	07 05	07 17	
										09 07	09 17	
							41	412	392	15 23	16 04	M
294	11	[Same]	V	14 23 24	15 14	15	32	246	123			
							37	150	57	15 06	15 12	
							28	100	46			
							16	83	20			
							13	105	51	15 01	15 13	
							26	175	180	16 18	16 23	I
295	12	[Same]	V	15 21	17 07	34	39	229	215			
							36	193	113	15 02	16 07	
										16 13	16 20	
							23	176	58			
							23	140				
							11	162	49	16 01	16 12	
							45	279	310	21 12	22 03	M+
296	13	[Same]	V	21 07	23 06	47	23	268	220			
							33	130	121	21 12	21 20	
							13	92		21 10	21 24	
							16	77	47	21 10	22 13	M+
							37	207	158	01 12	01 16	
297	14	[Same]	VI	01 01	01 20	19	23	233	169			
							27	190	51	01 02	01 05	
										01 12	01 16	
							12	131		01 06	01 17	
							16	141	52	01 02	01 18	

[1]	[2]	[3]	[4][5][6]	[7][8]	[9][10]	[11]	[12]	[13]	[14]	[15][16]	[17]
298	15	[Same]	VII 28 17	31 19	74	18 45 20	181 205 133	59 135 70	31 06 30 22 31 10	31 12 31 04 31 16	M+
						15 12	124 123	29 36	29 06 30 23 29 09 30 18	29 16 31 18 29 16 31 18	
299	16	[Same]	VIII 04 09 45	04 23	13	14 32 17	124 115 89	55 114 64	04 10 04 10	04 12 04 13	M+
						7 6	69 85	17 10	04 10 04 10	04 13 04 13	
300	17	[Same]	VIII 07 23 00	13 00	121	52 136 [illegible] 38	645 582 [illegible] [illegible]	637 748 113 226	08 09 08 20 09 21 08 05 10 06 10 16 08 09 10 17 11 05 08 08	08 16 09 05 10 20 08 21 10 10 10 20 08 22 10 20 11 12 08 14	I
						25 18	237 246	67 64	08 06 10 05 11 05 08 19 09 07 10 05 11 05	09 01 10 21 11 13 09 02 09 24 10 23 11 14	
301	18	[Same]	VIII 19 19 36	20 23	27	20 57 30 33	151 266 143 163	160 69 81 147	20 00 19 20 20 12	20 03 20 04 20 14	M
						22 16	142 114	38 41	20 00 20 10	20 14 20 15	
302	19	[Same]	VIII 28 09	30 22	61	16 47 23	129 125 120	51 122 70	29 11	29 12	M+
						10 8	65 143	16 32	29 09 30 08 29 09 30 05	29 20 30 14 29 21 30 14	
303	20	[Same]	IX 01 00	03 00	48	11 55	125 206	122 218	01 20	01 23	M+

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						12 8	102 125	29 16	01 12 02 08 01 12	01 23 02 22 01 23	
304	21	[Same]	IX 04 03	05 11	32	11 39 18	149 148 117	22 114 39	04 15	04 17	M+
						6 9	76 100	14 24	04 08	04 18	
305	22	[Same]	IX 22 20 45	26 17	92	12 25 27	134 133 127	263 41 99	22 21 22 21 25 09	23 01 23 12 25 20	M+
						15 11	99 113	17	22 21 24 15 25 10 22 16 24 04 25 05	23 02 24 24 25 18 22 24 24 24 25 18	
306	23	[Same]	IX 29 04	30 18	38	33 72 25	88 120 116	195 125 70	29 10 29 11	29 16 29 17	M+
						13 7	82 114	13 24	29 11 29 09	29 16 29 17	
307	24	[Same]	X 01 01 14	05 01	96	53	161	277	01 11 02 10 03 15 04 18	01 15 02 16 03 19 05 01	M
						98	333	585	01 09 02 05 03 10	01 15 02 16 03 19	
						35	132	101	01 04 03 15 04 19	01 16 03 20 05 00	
						37	172	60	02 09	02 17	
						14	144	48	01 09 02 09 03 11	01 15 02 15 03 19	
						9	154	29	01 04 02 04 03 17 04 13	01 17 02 17 03 23 04 24	
308	25	[Same]	X 09 22	12 18	68	22 27	118 153	500 166	10 06 11 11	10 10 11 15	M+

[1]	[2]	[3]	[4]	[5][6]	[7][8]	[9]	[10]	[11]	[12]	[13][14]	[15][16]	[17]
308	25	[Same]	X	09 22	12 18	68	17	134	28	11 10	11 20	M+
							13	128	25	10 06 11 11	10 15 11 20	
							8	141	17	10 06	10 15	
309	26	[Same]	X	14 08	15 22	38	58	242	267	14 20 15 10	15 02 15 21	M
							80	561	307	14 09 15 09	14 21 15 18	
							36	165	154	14 20 15 12	15 03 15 21	
							23	150	63	15 12	15 18	
							14	145	23	14 21 15 10	15 02 15 18	
							19	155	30	15 11	15 17	
310	27	[Same]	X	17 22 10	19 20	46	125	480	693	17 22 18 18	18 02 19 17	VI
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							62	327	354	17 22 18 16	18 10 19 20	
							70	253	175	17 22	18 02	
							36	239	31	17 22 18 18	18 02 19 14	
							41	310	58	17 22 18 18	18 10 19 03	
311	28	[Same]	X	20 14	28 00	178	71	202	285	20 14 21 16 22 18 23 12 24 13	20 19 21 22 22 23 23 23 24 20	I
							97	394	474	20 14 21 08 22 11 23 11 24 11 25 14 27 12	20 20 21 22 22 15 23 18 24 20 25 18 27 15	
							55	183	190	20 14 21 16 27 12	20 20 22 00 27 15	
							33	160	77	22 10	22 14	
							16	127	27	21 05 22 10 23 10 24 11	21 21 22 21 23 21 24 20	
							28	106	38	21 04 22 09 23 12 24 11	21 22 22 15 23 18 24 20	

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									02 20	02 23	
						84	348	528	02 07	02 10	
						37	123	186	02 10	02 22	
						28	145	73			
						15	140	36	02 07	02 23	
						12	156	48	01 19	02 24	
313	30	[Same]	XI 15 14	19 21	103	33	113	100			M+
						45	247	120	17 09	17 17	
									18 12	18 19	
						19	102	27	15 19	16 01	
									17 02	17 09	
									18 06	18 08	
									19 06	19 08	
						7	62	23	15 18	16 04	
									17 11	17 21	
									18 12	18 19	
						16	119	42	17 11	17 21	
									18 13	18 19	
314	31	[Same]	XI 20 11	21 14	27	71	202	285	20 14	20 19	I
									21 16	21 22	
						67	420	345	20 11	20 21	
						59	136	118	20 11	20 22	
						30	126	41			
						17	91	27	20 11	20 21	
						15	119	42	20 10	21 11	
315	32	[Same]	XI 22 08	26 17	105	47	197	124	22 18	22 23	M
									23 12	23 23	
									24 13	24 20	
									24 17	24 19	
						38	178	175	22 09	22 21	
									25 12	25 17	
									26 09	26 14	
						27	126	82	22 12	23 00	
									25 10	25 22	
						8	64	14			
						43	97	16	24 15	24 22	
									25 11	25 21	
316	33	[Same]	XII 21 06	22 00	18	31	96	256	21 14	21 17	M
						45	276	307	21 10	21 19	
						32	109	69	21 08	21 22	
						20	101	25	21 14	21 18	
						12	93	14	21 08	21 18	
						10	117	29	21 09	21 17	
317	34	[Same]	XII 25 10	26 07	21	73	524	373	25 16	25 17	I
						69	324	363	25 14	25 23	
						55	115	128	25 12	26 00	
317	34	[Same]	XII 25 10	26 07	21	21	130	48	25 15	25 17	I
									25 20	25 22	
						15	94	15	25 13	25 22	
						16	165	32	25 13	25 24	
318	35	[Same]	XII 30 14	31 21	31			251	30 15	30 23	I
									31 14	31 17	
						69	334	362	30 16	30 21	
									31 15	31 17	
						31	159	88	30 15	31 00	
						23	188	39	30 15	30 17	
									31 09	31 17	
						15	157	12	30 15	30 23	
									31 09	31 17	
						13	144	24	30 14	30 24	
									31 09	31 17	

FIGURES

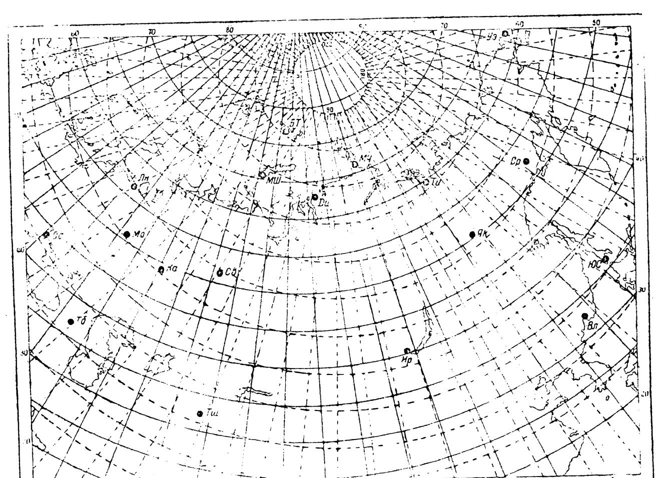

FIGURE 1

The circles indicate the magnetic observatories. The names of the observatories are given abbreviated (for explanations see Table 1). The solid circles and straight lines are the georagnetic parallels and meridians. The dotted ones are the geographic

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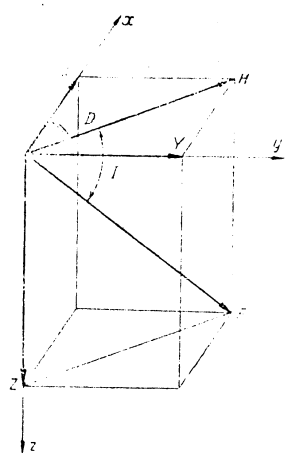

FIGURE 2

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13 May 1953 Moscow, Tepfer Magnetograph I 14 May 1953

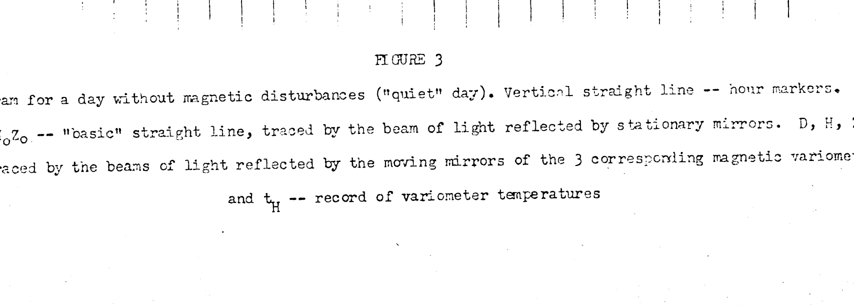

FIGURE 3

Magnetogram for a day without magnetic disturbances ("quiet" day). Vertical straight line -- hour markers. Straight lines $D_oH_oZ_o$ -- "basic" straight line, traced by the beam of light reflected by stationary mirrors. D, H, Z, -- curves traced by the beams of light reflected by the moving mirrors of the 3 corresponding magnetic variometers; t_o and t_H -- record of variometer temperatures

20 September 1951 | Moscow, Tepfer Magnetograph I | 21 September 1951

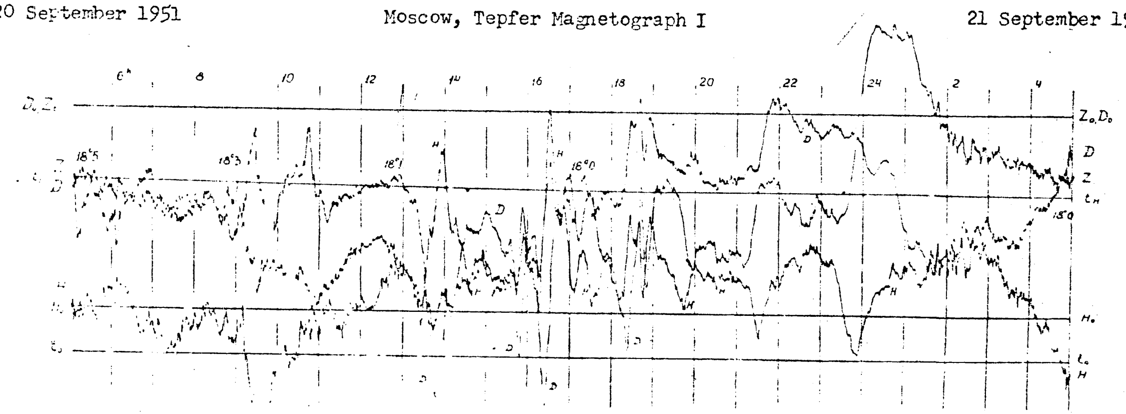

FIGURE 4

Magnetogram of day with magnetic storm. For symbols see caption of Figure 3

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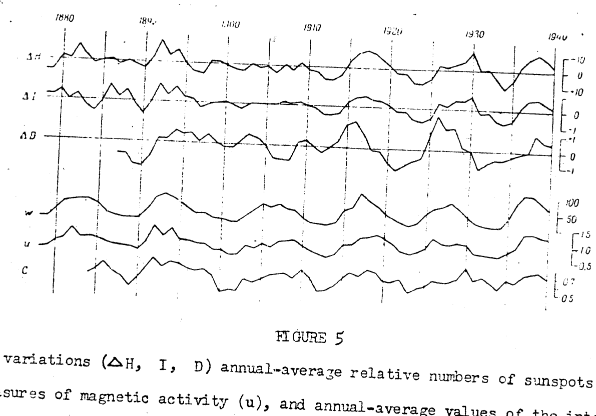

FIGURE 5

Cyclic geomagnetic variations (ΔH, I, D) annual-average relative numbers of sunspots (W), annual-average values of the u-measures of magnetic activity (u), and annual-average values of the international characteristic C of the magnetic activity (C). Cyclic variations of H in gammas. Cyclic variations of I and D in minutes (right-hand scales) scales of W, u, and C to the right. Vertical straight lines represent 5-year periods.

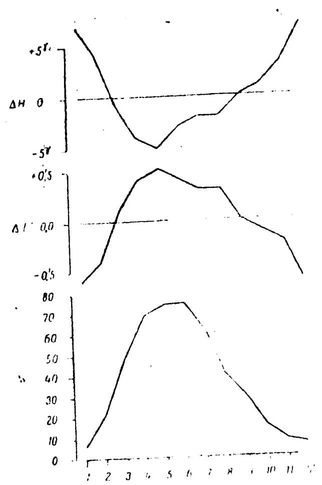

FIGURE 6

Averaged cyclic variation (average for 1878-1940). ΔH -- of horizontal component, ΔI -- of inclination, W -- of relative sunspot number. The averaging was carried out over years occupying an identical place in the 11-year solar-activity cycle.

Horizontal -- years counted from the minimum-activity years.

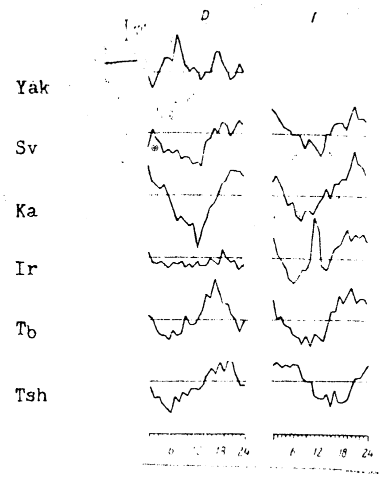

FIGURE 7

Long-period variations of declination (D) and inclination (I).

Horizontal markings represent months

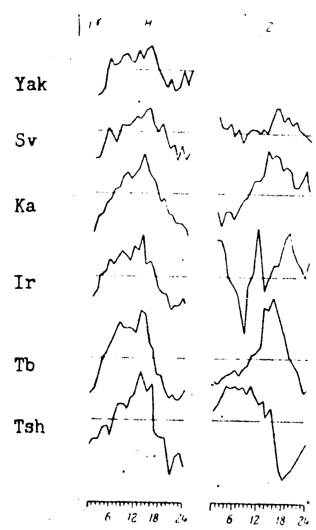

FIGURE 8

Long-period variations of horizontal (H) and vertical (Z) component.

Horizontal markings represent months

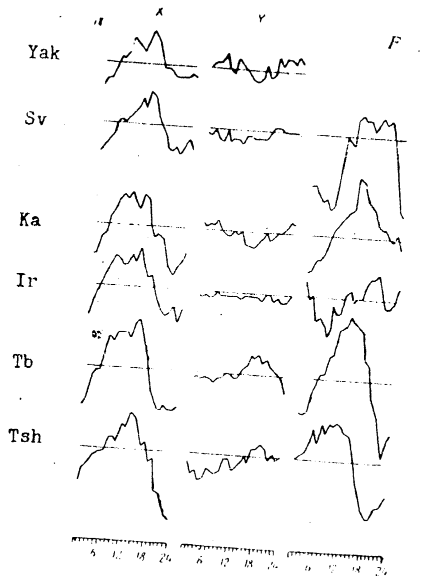

FIGURE 9

Long-period variations of Northern (X) and eastern (Y) component and total intensity (F). Horizontal markings represent months.

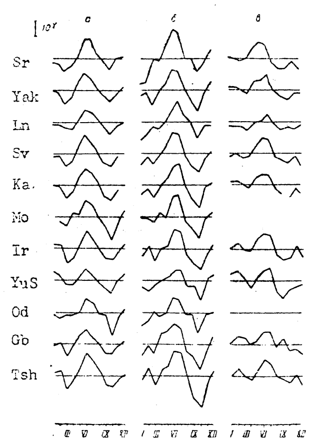

FIGURE 10

Annual variations of horizontal component (H). Horizontal markings -- months. (a) for all years 1938-1948). (b) for years of maximum solar activity, 1938, 1947, 1948. (c) for years of minimum solar activity, 1943, 1944

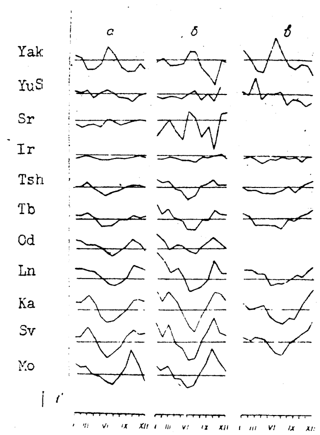

FIGURE 11

Annual variations of declination (D). Observatories are arranged in a sequence corresponding to the values of the angle between the magnetic and geomagnetic meridians.

For designations see Figure 10

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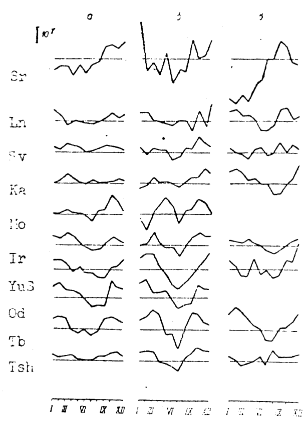

FIGURE 12

Annual variations of vertical component (Z). Designations same as Figure 10

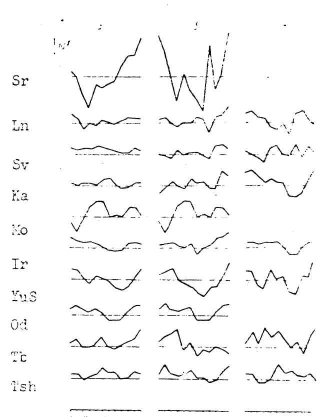

FIGURE 13

Annual variations of Total Intensity (F). Designations same as Figure 10

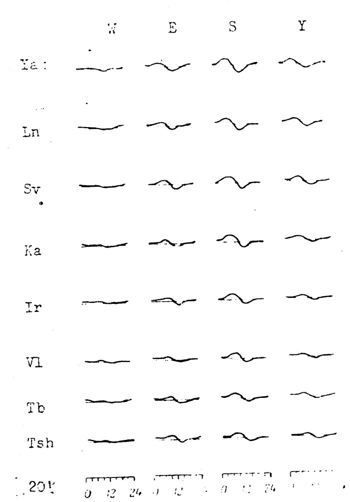

FIGURE 14

Daily variations of declination (D) for quiet days (averages for 11 years). W -- winter, E -- equinox, S -- summer, Y -- year. Names of observatories to the left; local time in hours below

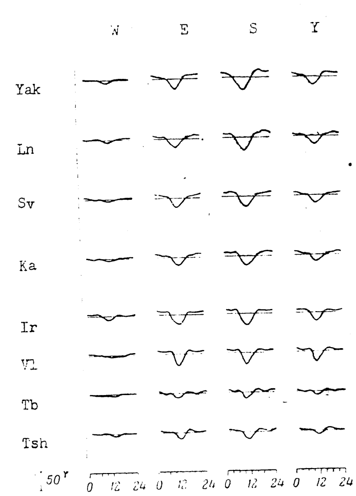

FIGURE 15

Daily variations of horizontal component (H) for quiet days (averages for 11 years). Designations same as Figure 14.

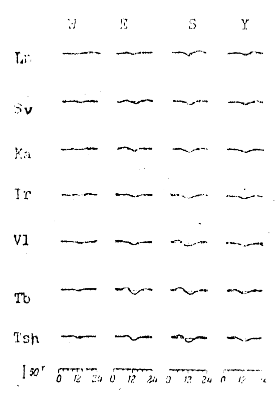

FIGURE 16

Daily variations of vertical component (Z) for quiet days (averages for 11 years). For designations see Figure 14.

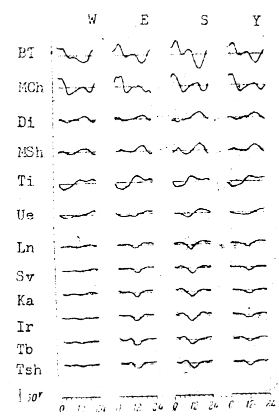

FIGURE 17

Daily variations of total intensity (F) for r quiet days (average for 11 years). For designations see Figure 14.

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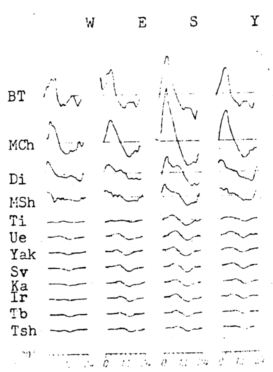


FIGURE 18

Daily variations of declination (D) for quiet days for year of low magnetic activity. For designations see Figure 14

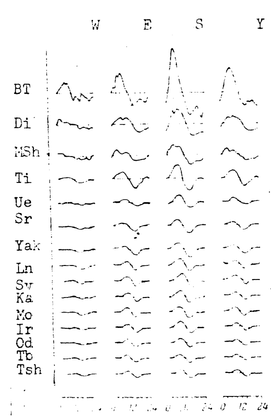
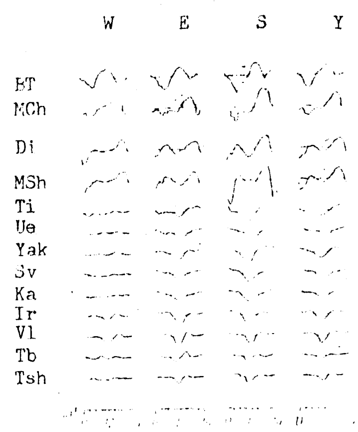


FIGURE 19

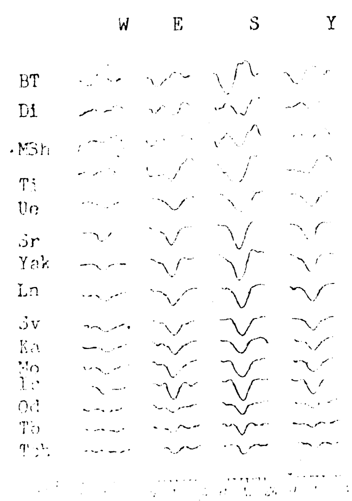
Daily variations of declination (D) for quiet days for year of high magnetic activity. For designations see Figure 14

FIGURE 20



Daily variations of horizontal component (H) for quiet days for year of low magnetic activity. For designations see Figure 14.

FIGURE 21



Daily variation of horizontal component (H) for quiet days for year of high magnetic activity. For designations see Figure 14

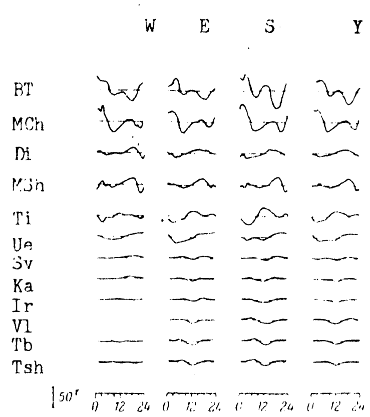


FIGURE 22

Daily variations of vertical component (Z) for quiet days for year of low magnetic activity. See Figure 14 for designations

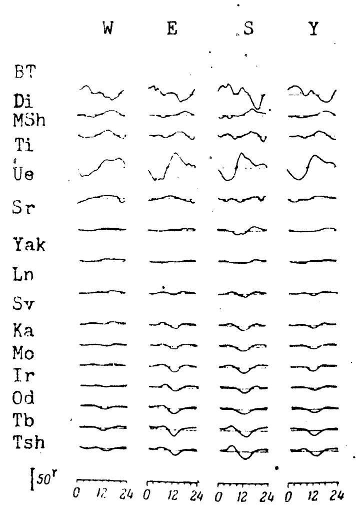
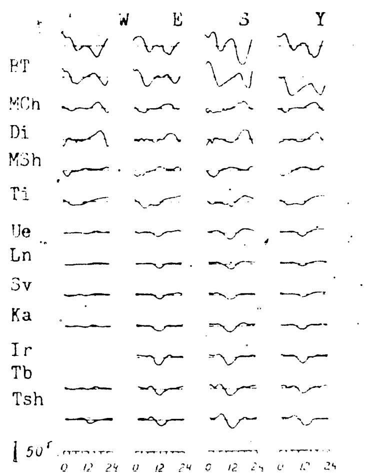


FIGURE 23

Daily variations of vertical component (Z) for quiet days for year of high magnetic activity. See Figure 14 for designations

FIGURE 24



Daily variations of total intensity (F) for quiet days for years of low magnetic activity. See Figure 14 for designations

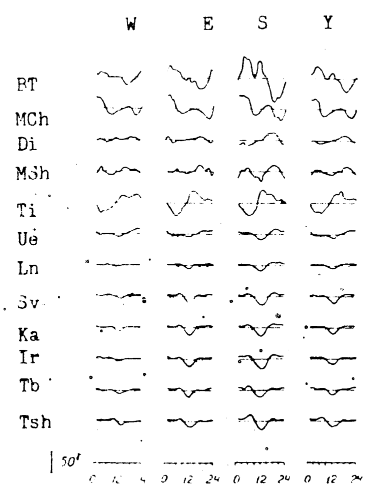


FIGURE 25

Daily variation of total intensity (F) for quiet days for year of high magnetic activity. See Figure 14 for designations

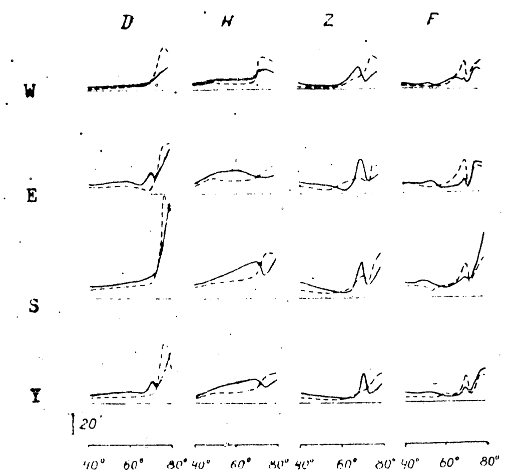


FIGURE 26

Dependence of the amplitude of the daily variations of the declination (D); horizontal (H), vertical (Z) components; and absolute force (F) on the geographic latitude on quiet days. W: winter; E: equinox; S: summer; Y: year. Solid line: year of maximum magnetic activity; broken line: year of minimum magnetic activity in relation to horizontal geographic latitude

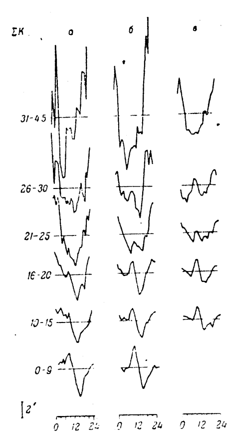


FIGURE 27

Daily variations of declination (D) for winter days with various values of daily sums of the K-index (ΣK). (a) Yakutsk, (b) Kazan', (c) Tashkent. Daily sums of the K index correspond to the 3-ball daily characteristizations (0, 1, 2) in the following manner; sums from 0 to 20 -- 0; from 21 to 30 -- 1, from 31 upward -- 2

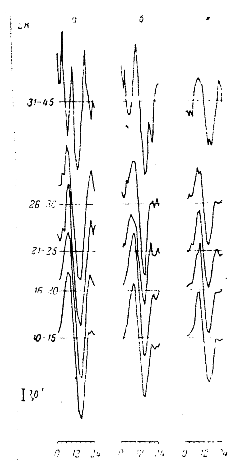


FIGURE 28

Daily variations in declination (D) for summer days with various values of daily sums of K-index. See Figure 27 for designations

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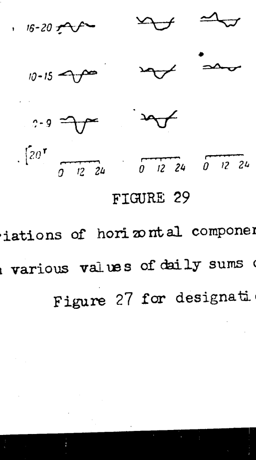

FIGURE 29

Daily variations of horizontal component (H) for winter days iith various values of daily sums of K-index. See Figure 27 for designations

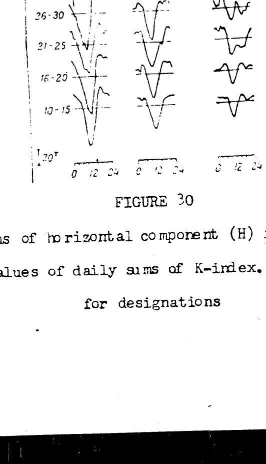

FIGURE 30

Daily variations of horizontal component (H) for summer days with various values of daily sums of K-index. See Figure 27 for designations

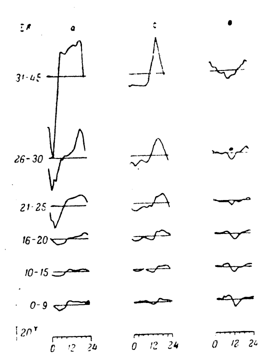

FIGURE 31

Daily variations of vertical component (Z) for winter days with various values of daily sums of K-index. See Figure 27 for designations

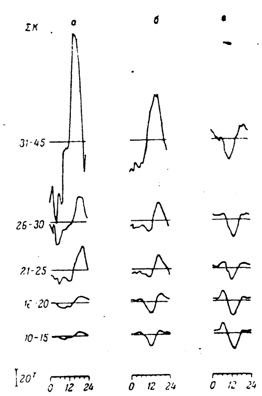

FIGURE 32

Daily variations of vertical component (Z) for summer days with various values of sums of K-index. See Figure 27 for designations

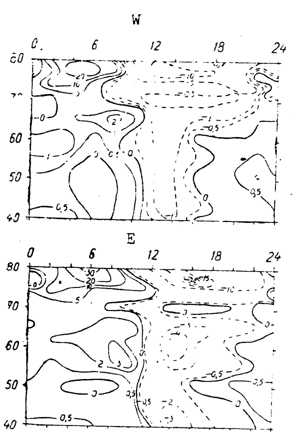

FIGURE 33

Isograms of daily variations of declination (D) for quiet days W -- winter, E -- equinox. Left -- geographic latitudes, top -- local time in hours; the isograms are marked with values in angular minutes

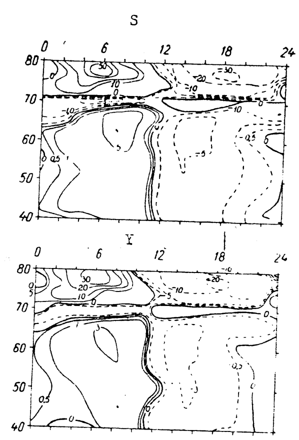

FIGURE 34

Isograms of daily variations of declination (D) for quiet days. S -- summer, Y -- year. For designation see Figure 33

FIGURE 35

Isograms of daily variations of horizontal component (H) for quiet days. W -- winter, E -- equinox. Left -- geographic latitudes, top -- local time in hours, isograms are marked with values in gammas

FIGURE 36

rams of daily variations of horizontal component for quiet days. S -- summer, Y -- year. For designations see Figure 35

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FIGURE 37

Isograms of daily variations of vertical component (Z) for quiet days. W -- winter, E -- equinox. For designations see Figure 35

FIGURE 38

Isograms of daily variations of vertical component (Z) for quiet days. S -- summer, Y -- year. For designations see Figure 35

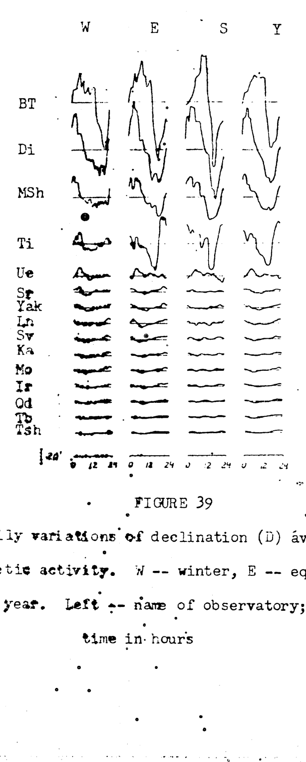

FIGURE 39

Disturbed daily variations of declination (D) averaged for year of high magnetic activity. W -- winter, E -- equinox, S -- summer, Y -- year. Left -- name of observatory; below -- local time in hours

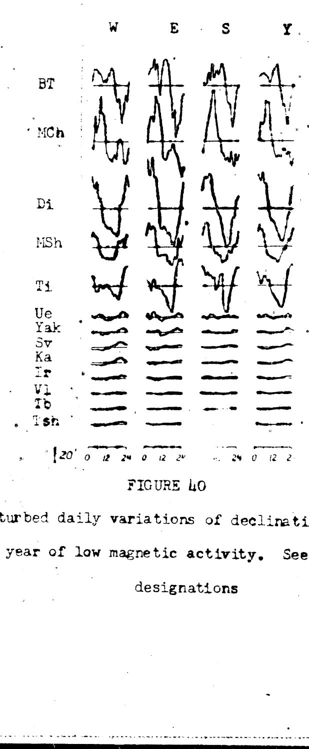

FIGURE 40

Disturbed daily variations of declination (D) averaged for year of low magnetic activity. See Figure 30 for designations

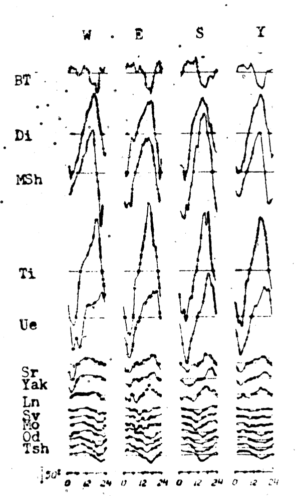

FIGURE 41

Disturbed daily variations of horizontal component (H) averaged for year of high magnetic activity. See Figure 39 for designations

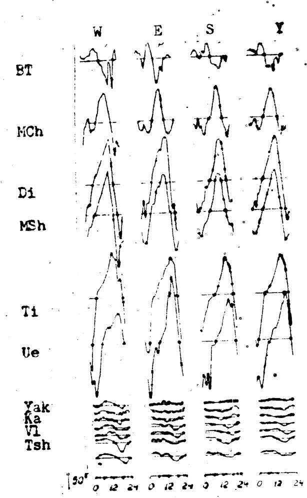

FIGURE 42

Disturbed daily variations of horizontal component (H) averaged for year of low magnetic activity. See Figure 39 for designations

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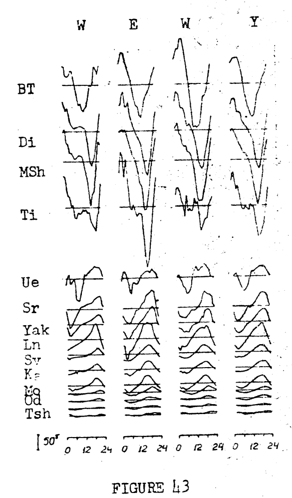

FIGURE 43

Disturbed daily variations of vertical component (Z) averaged for years of high magnetic activity. See Figure 39 for designations

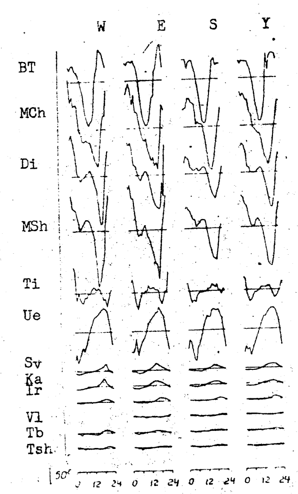

FIGURE 44

..turbed daily variations of vertical component (Z) ..eraged for year of low magnetic activity. See Figure 39 for designations

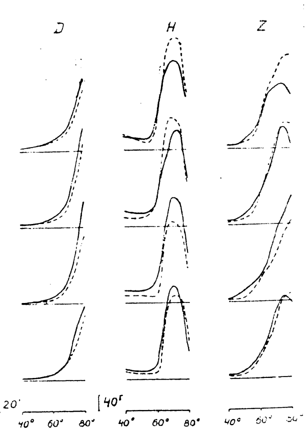

FIGURE 45

Dependence of the amplitudes of the disturbed daily variations of declination (D), horizontal component (H), and vertical component (Z) on the geographic latitude. W -- winter, E -- equinox, S -- summer, y -- year. Solid line is for the year of the maximum, dotted line for the year of minimum magnetic activity

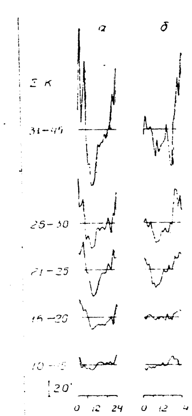

FIGURE 46

Disturbed daily variations of declination (D) for days with various values of daily sums of K-index (winter).

For designations see Figure 27

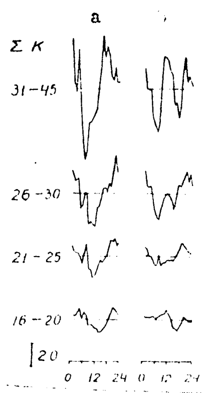

FIGURE 47

Disturbed daily variations of declination (D) for days with various values of daily sums of K-index (summer). For designations see Figure 27

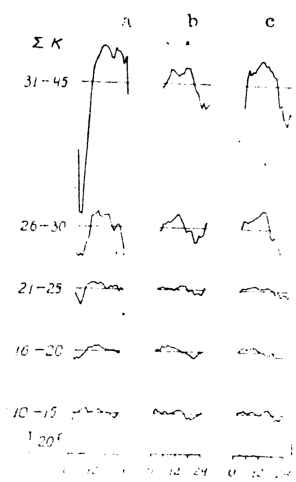

FIGURE 48

Disturbed daily variations of horizontal component (H) for days with various values of daily sums of K-index (winter). For designations see Figure 27

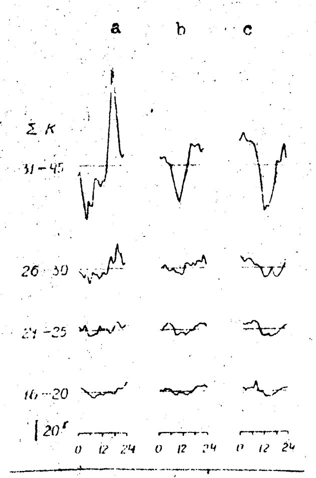

FIGURE 49

Disturbed daily variations of horizontal component (H) for days with various values of daily sums of K-index (summer). For designations see Figure 27

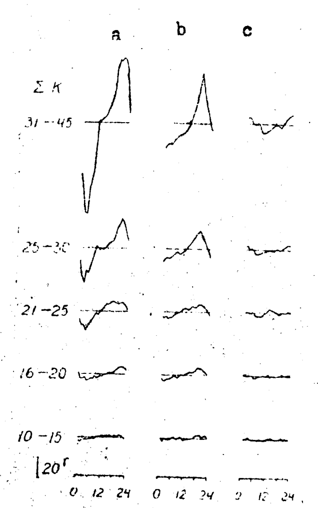

FIGURE 50

Disturbed daily variations of vertical component (Z) for days with various values of daily sums of K-index (winter). For designations see Figure 27

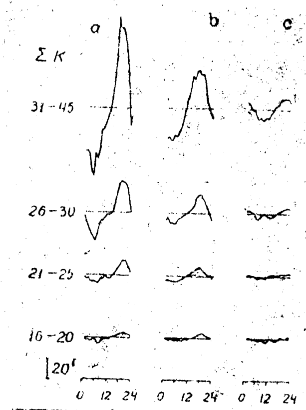

FIGURE 51

Disturbed daily variations of vertical component (Z) for days with various values of daily sums of K-index (summer. For designations see Figure 27

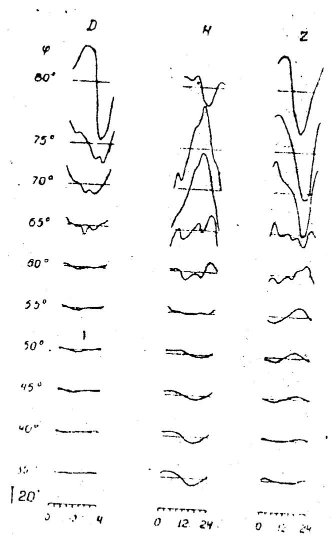

FIGURE 52

Dependence of the form of the disturbed daily variations on the geographic latitude (φ) for longitude of 50°, for year of maximum magnetic activity

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FIGURE 53

Dependence of the form of the disturbed daily variations on the geographic latitude (φ) for 100° longitude, in the year of maximum magnetic activity

FIGURE 54

Isograms of disturbed daily variations of declination (D) averaged for the maximum year. 1 -- moderately disturbed day, 2 -- highly disturbed day. Left -- geographi latitudes, to. -- local time in nours; isograms marked with values in gammas

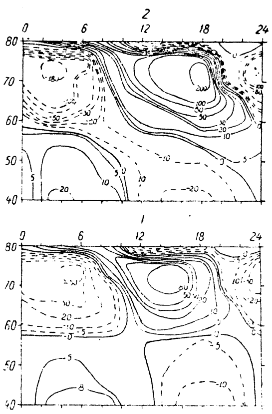

FIGURE 55

Isograms of disturbed daily variations of horizontal component (H). 1 -- moderately disturbed day; 2 -- highly disturbed day. Left -- geographic latitudes, top -- local time in hours; isograms marked with values in gammas.

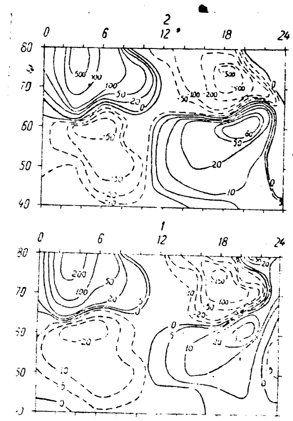

FIGURE 56

Isograms of disturbed daily variations of vertical component (Z). For designations see Figure 55.

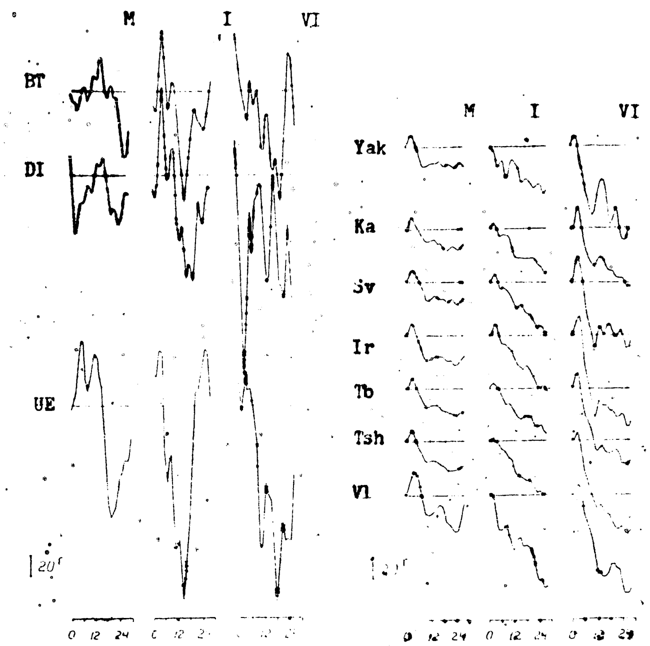

FIGURE 57

Aperiodic variations in horizontal component (H) for storms of various intensities. M -- moderate storms; I -- intense storms; VI -- very intense storms. Below -- hours from beginning of storm

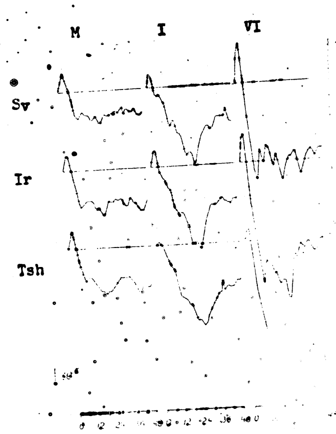

FIGURE 58

Aperiodic variations in horizontal component (H) for storms of various intensities. For designations see Figure 57

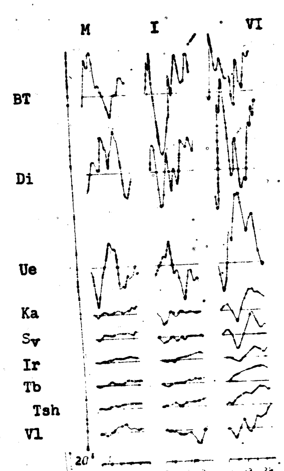

FIGURE 59

Aperiodic variations of vertical component (Z) for storms of various intensities. For designation see Figure 57

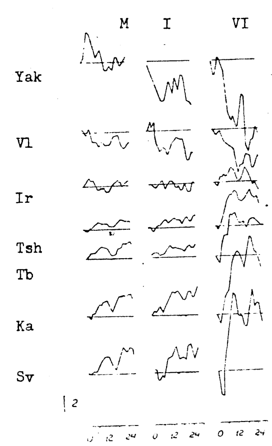

FIGURE 60

Aperiodic variations in declination (D) for storms of various intensities. Observatories arranged in order corresponding to angle between magnetic and geomagnetic meridians. For designations see Figure 57

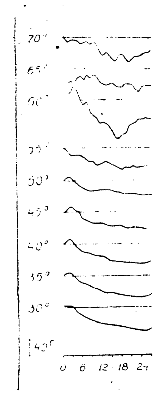

FIGURE 61

Aperiodic variations of horizontal component (H) for various equidistant geomagnetic latitudes. Below, hours since beginning of storm

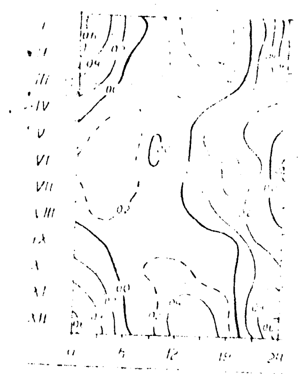

FIGURE 62

Srednikan. Isopleths of daily course of geomagnetic activity as measured by K-index. All days. Left -- months, below -- local time; isograms marked with values of deviation from daily average

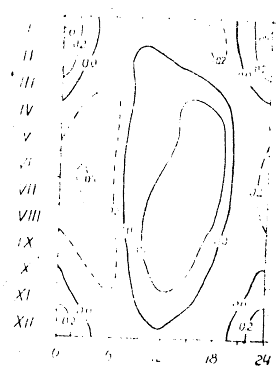

FIGURE 63

Srednikan. Isopleth of daily course of geomagnetic activity as measured by K-index. Disturbed days. For designations see Figure 62

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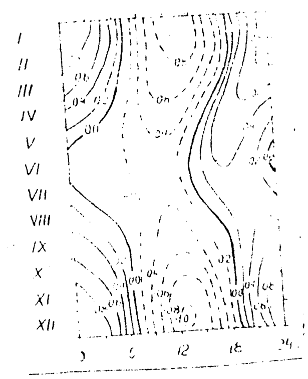

FIGURE 64

Srednikan. Isopleths of daily course of geomagnetic activity as measured by K-index. Disturbed days. For designations see Figure 62

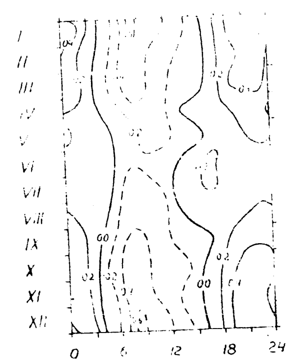

FIGURE 65

Kazan'. Isopleths of daily course of geomagnetic activity as measured by K-index. All days. For designations see Figure 62

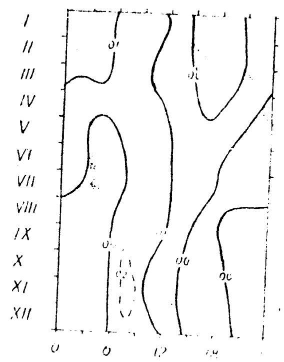

FIGURE 66

Kazan'. Isopleths of daily course of geomagnetic activity as measured by K-index. Quiet Days. For designations see Figure 62

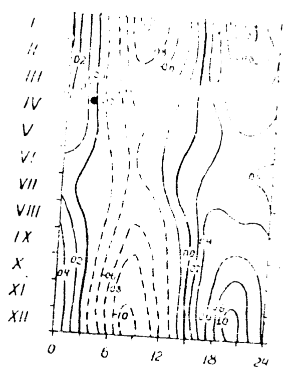

FIGURE 67

Kazan'. Isopleths of daily course of geomagnetic activity as measured by K-index. Disturbed days. For designations see Figure 62

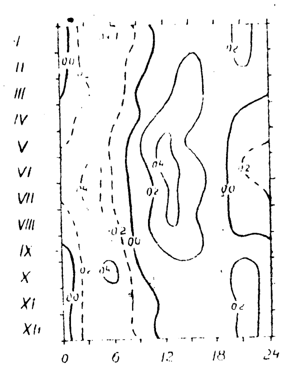

FIGURE 68

Tashkent. Isopleths of daily course of geomagnetic activity as measured by K-index. All days. For designations see Figure 62

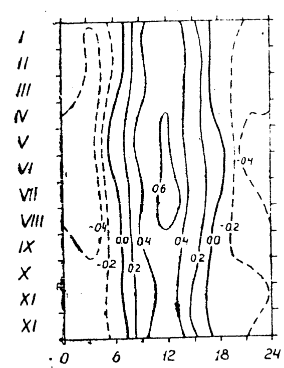

FIGURE 69

Tashkent. Isopleths of daily course of geomagnetic activity as measured by K-index. Quiet days. For designations see Figure 62

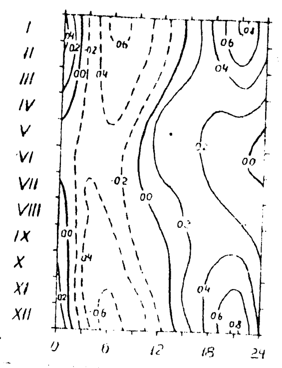

FIGURE 70

Tashkent. Isopleths of daily course of geomagnetic activity as measured by K-index. Disturbed days. For designations see Figure 62

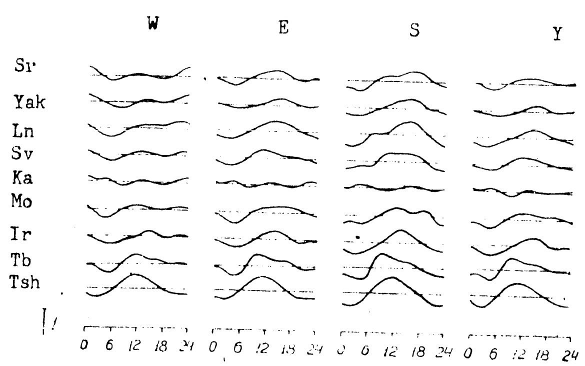

FIGURE 71

Daily course of geomagnetic activity measured by K-index. Quiet days. W -- winter, E -- equinox, S -- summer, Y -- year. Below -- local time in hours. Ordinates marked in fractions of ball units of K-index

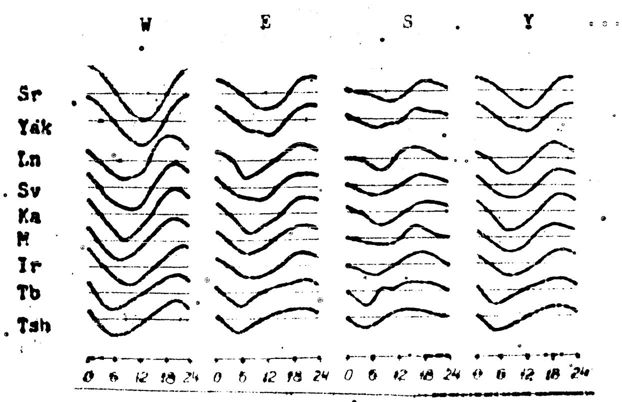

FIGURE 72

Daily course of geomagnetic activity measured by K-index. Disturbed days. For designations see Figure 71

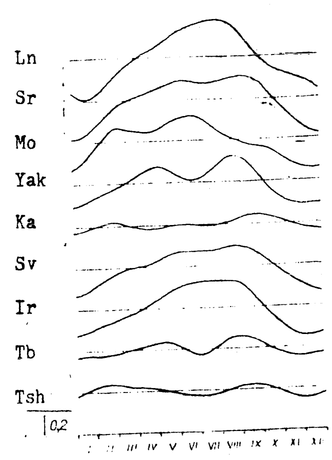

FIGURE 73

Annual course of geomagnetic activity measured by K-index. Quiet days. Below -- months; left -- names of observatories, ordinates in [illegible] of ball units of K-index

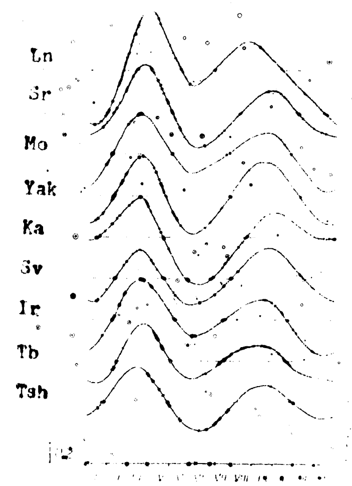

FIGURE 74

Annual course of geomagnetic activity measured by K-index. Disturbed days. For designation see Figure 73

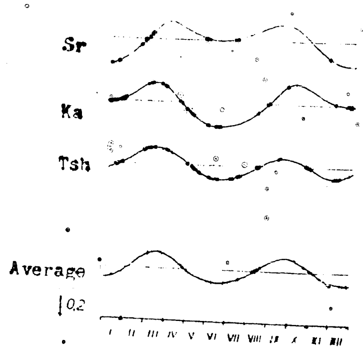

FIGURE 75

Annual course of geomagnetic activity measured by K-index. All days. Average for 11 years (1938-1948). For designations see Figure 73

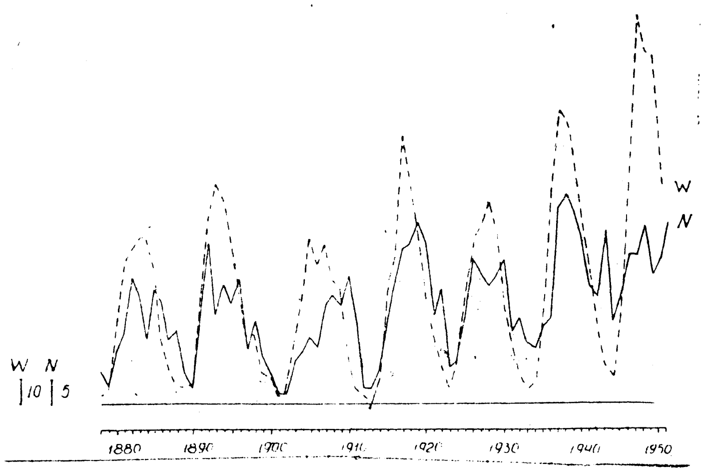

FIGURE 76

Number of storms by years (1878-1951). Solid lines show the number of storms (N), dotted line -- relative sunspot numbers (W). Below-- years, left -- scale in units. Straight line parallel to year scale is the zero line of N and W

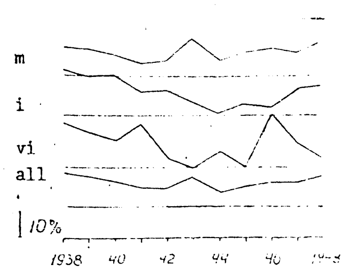

FIGURE 77

Number of storms of various categories by years (1938-1948). m -- moderate, i -- intense, vi -- very intense, all -- storms of all categories taken together. Below-- years. 100% represents all storms of a given category in the 11 years

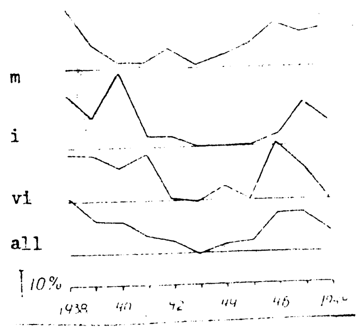

FIGURE 78

Number of storms with sudden beginnings by years (1938-1948). For designations see Figure 77

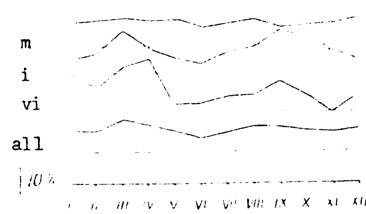

FIGURE 79

Annual course of number of storms. Left -- number of storm categories. m -- moderate, i -- intense, vi -- very intense, all -- all storms of all categories taken together, below -- months. 100% represents all storms of a given category for 11 years

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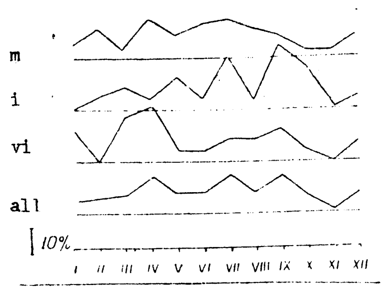


FIGURE 80

Annual course of number of magnetic storms with sudden beginnings. For designations see Figure 79

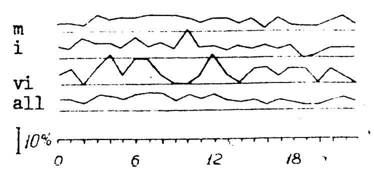


FIGURE 81

Daily course of beginnings of magnetic storms (1938-1948). Left -- categories of storms: m -- moderate, i -- intense, vi -- very intense. all -- all storms of all categories taken together, below -- hours world time, 100% represents all beginnings of storms of a given category

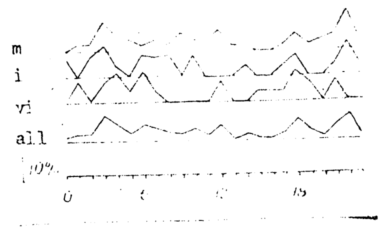


FIGURE 82

Daily course of sudden beginnings of magnetic storms (1938-1948)

For designations see Figure 81

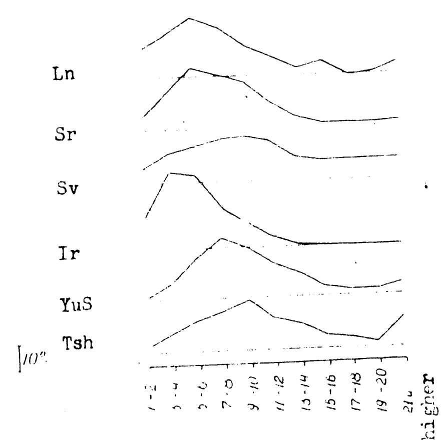


FIGURE 83

Number of occurrences of different time lapse since beginning of active period. Left -- name of observatory, below -- duration in hours. Scale -- number of occurrences

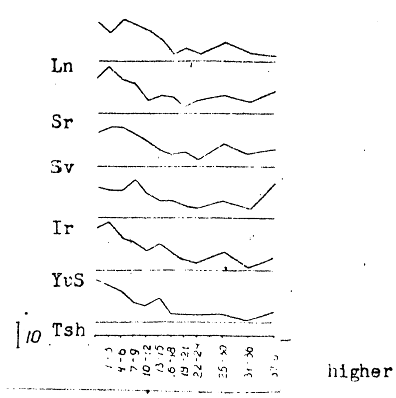


FIGURE 84

Duration of active periods of storms. Number of occurrences in percent. Left -- names of observatories; below -- duration in hours

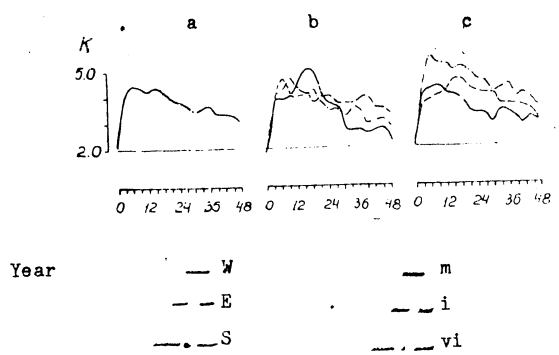


FIGURE 85

Distribution of magnetic activity (measured by K-index) during the storm. (a) year, (b) W -- winter, E -- equinox, S -- summer; (c) m -- moderate, i -- intense, vi -- very intense storms. Below -- time from beginning of storm in hours, left -- balls of K-index

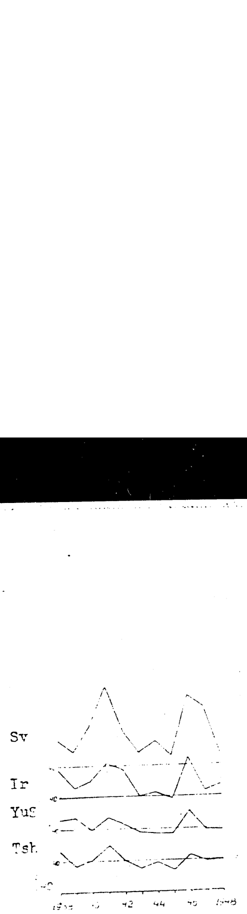


FIGURE 86

Maximum yearly amplitudes of storms on declination (D). Vertical scale is 40. Horizontal line for each observatory corresponds to an amplitude of 40. Below -- years, left -- names of observatories.

FIGURE 87

Maximum year amplitudes of storms in horizontal component (H). Horizontal line for each observatory corresponds to an amplitude of 200 gammas. Below -- years, left -- names of observatories

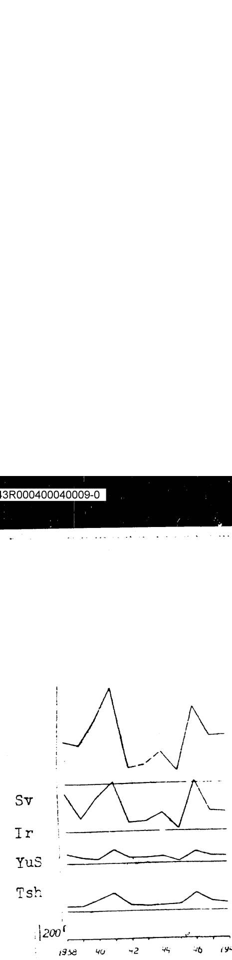
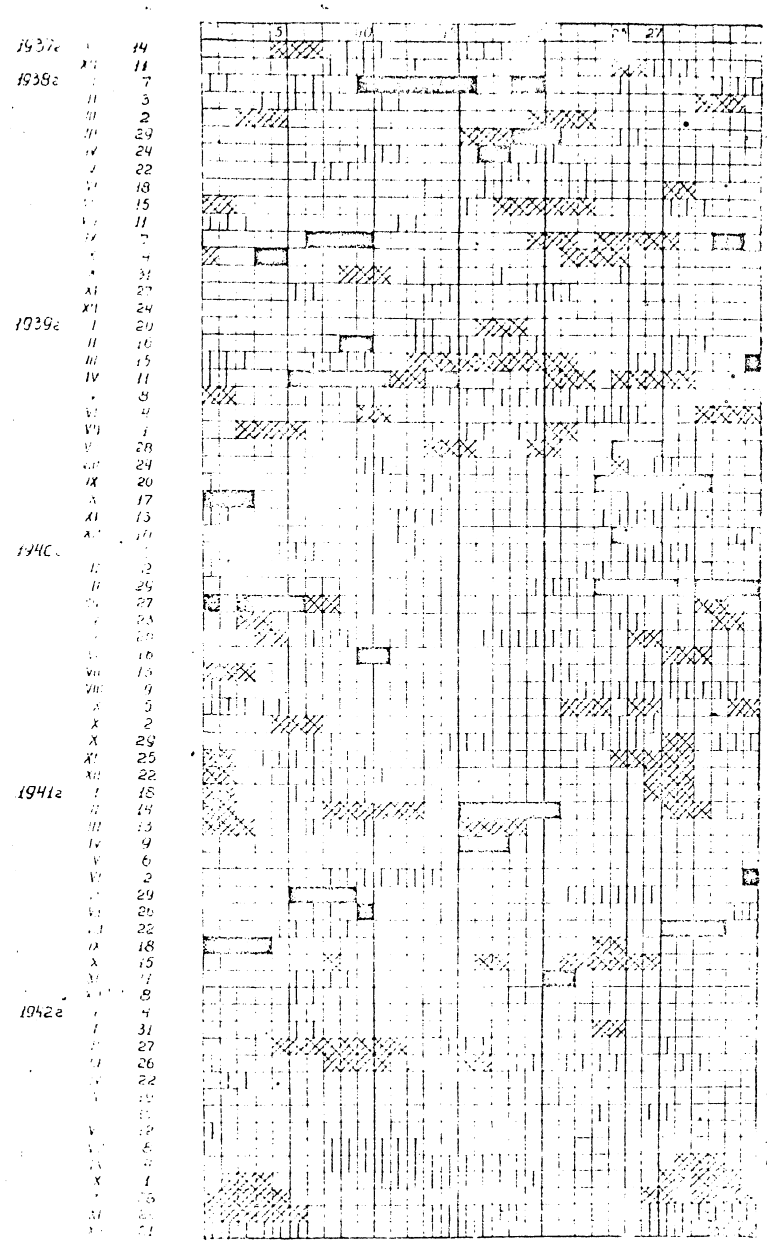


FIGURE 88

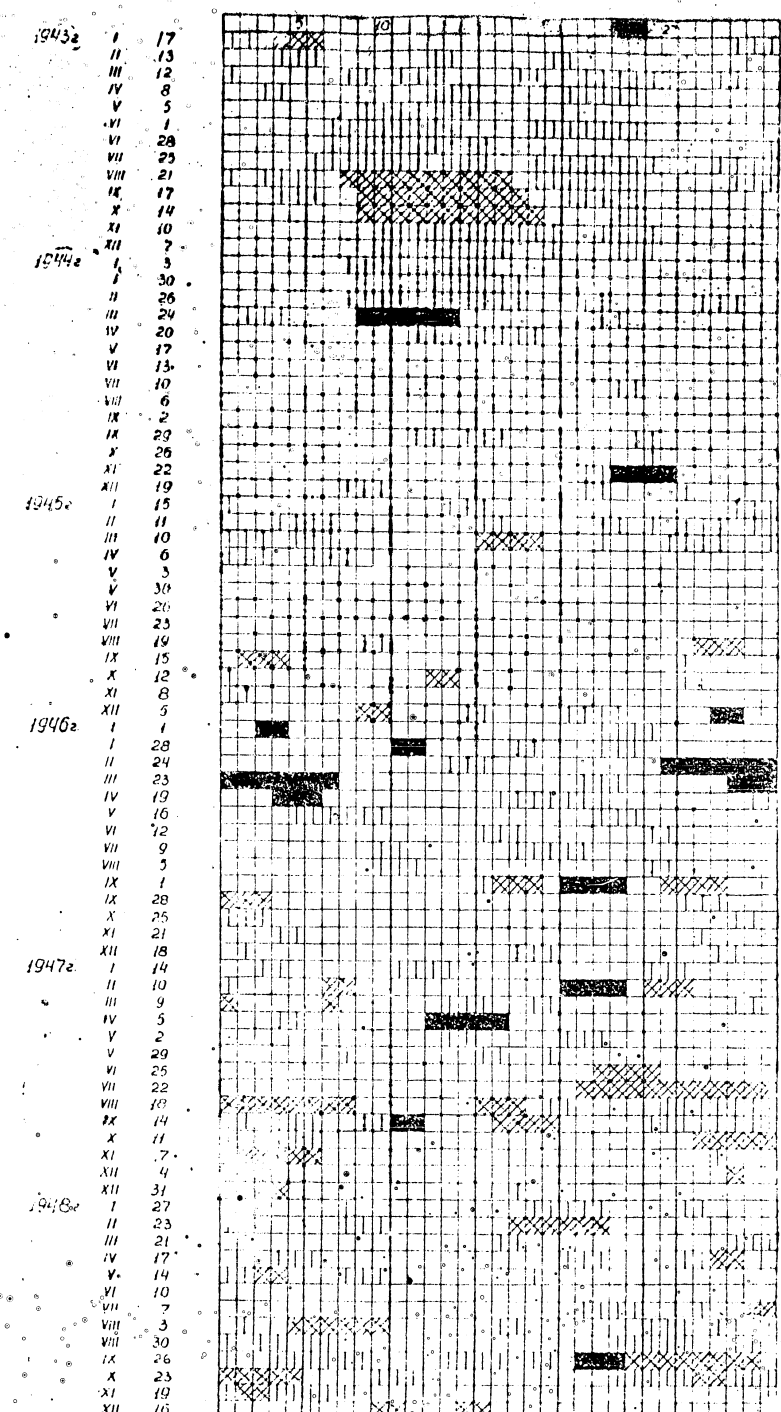
Maximum yearly amplitudes of storms in vertical component (Z). Horizontal line represents zero. Other designation same as in Figure 87



III m   i   vi

FIGURE 89

Recurrence of magnetic storms in 1938-1948. Above -- number of days in 27-day cycle. Left -- dates of first days in the rows.



-- days of moderate storms, i -- days of intense storms, vi --

days of very intense storms

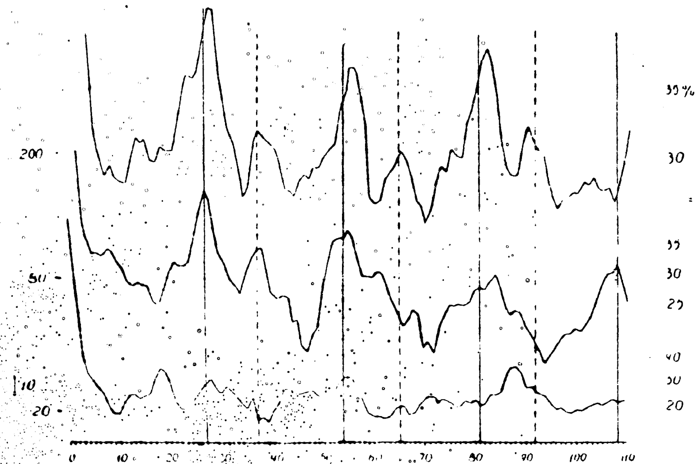


FIGURE 90

Recurrence of magnetic storms. Curves showing number of days of storms of all 3 categories (m, i, vi) occurring every day that is separated by 0, 1, 2 ... 110 days from the storm day. Upper curve represents sequence within the 110 days, starting with days of moderate storms; middle line -- same for intense storms; lower line -- same for very intense storms. Below -- days (0-110). Left-hand scales are in units of number of days; right-hand scales are in percent. (100% represents the number of days of the corresponding category -- m, i, or vi -- taken as zero for the 0-110 day scale).

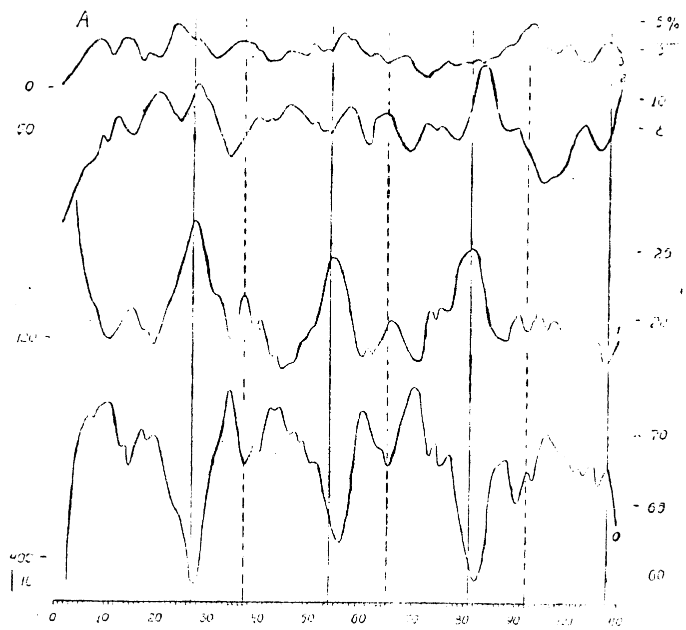


FIGURE 91

Recurrence of magnetic storms. Curves showing number of days of definite category (m, or i, or vi) occurring every day that is separated by 0, 1, 2, ..., 110 days from a storm day. A -- for a 110-day sequence beginning with moderate-storm days. Curve 0 -- number of days without storm arising for each day within the 0-110 day range, curve 1-number of days of mild storms; Curve 2 -- the same for intense storms; 3 -- the same for very intense storms. B -- the same for the 110-day sequence beginning with a day of intense storm. C -- the same for a 110-day sequence beginning with a day of very intense storm. Left -- scale in units; right -- scale in percent (100% represents number of sequences beginning with m, i, and vi storms respectively).

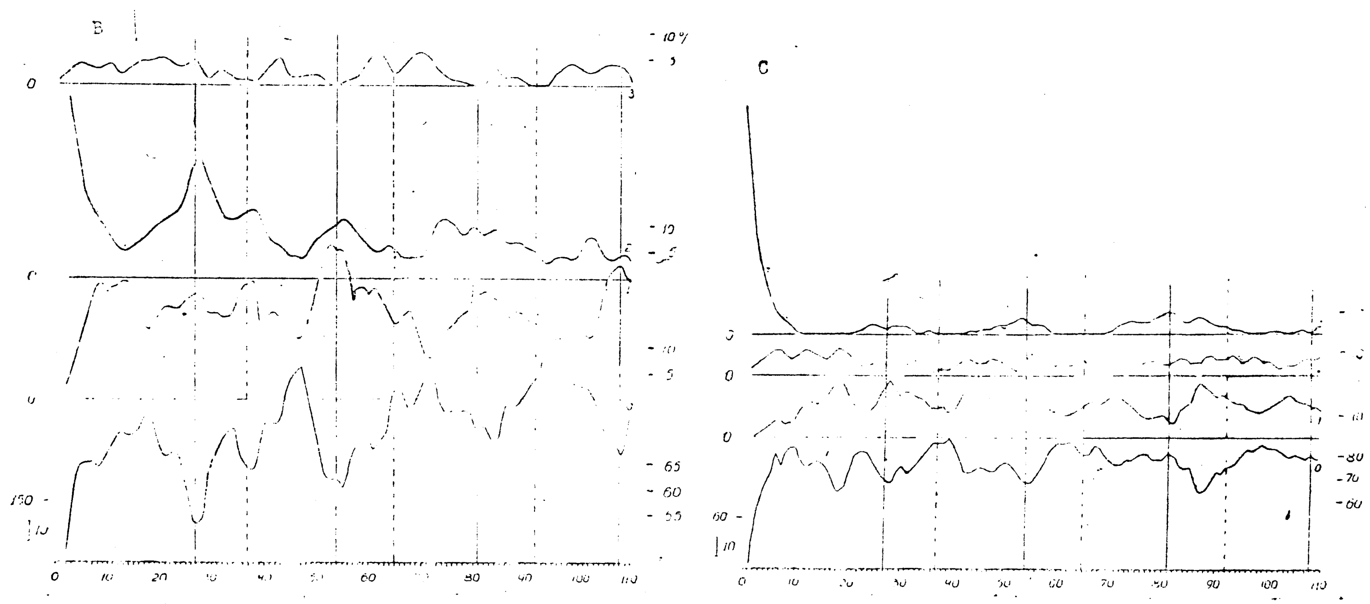


FIGURE 91

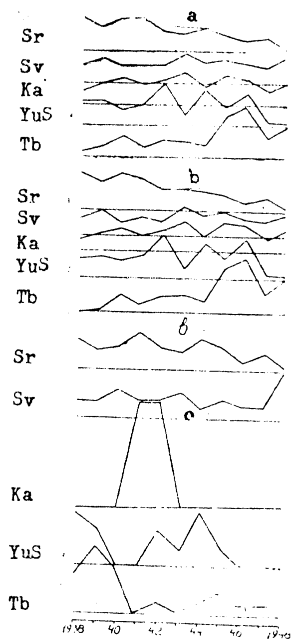


FIGURE 92

Percentage distribution of number of disturbance bays by years. a -- all bays, b -- positive bays, c -- negative bays. 100% represents the number of bays of a corresponding category for all 11 years.

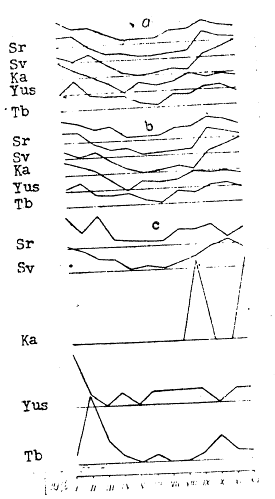


FIGURE 94

Percentage distribution of number of disturbance bays by months. For symbols a, b, c, see Figure 92

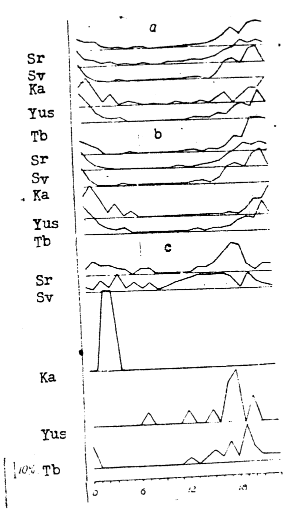


FIGURE 94

Percentage distribution of disturbance bays by hours of the day, measured in local time. For symbols a, b, c, see Figure 92

1 October 1944

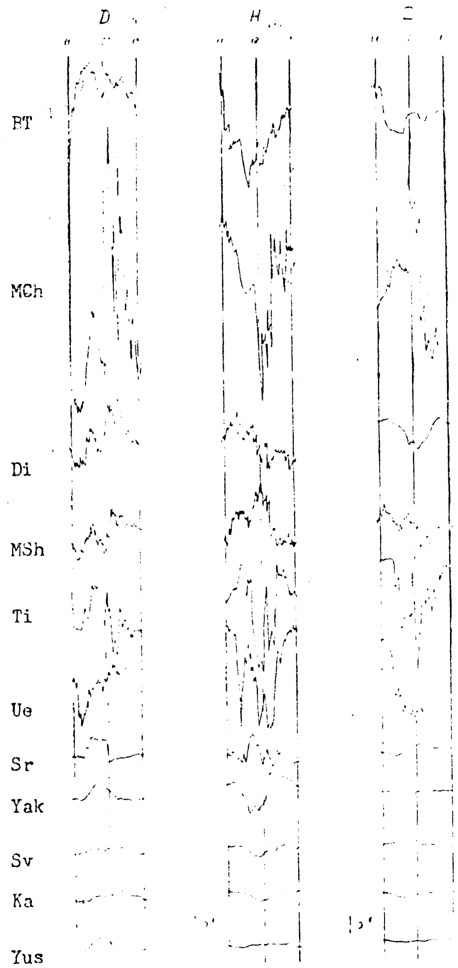


FIGURE 95

Geographic distribution of disturbance bays. Copies of magnetograms of various observatories. Left -- names of observatories. Top -- world time. Baylike disturbances are noted at middle-latitude observatories

14 January 1948

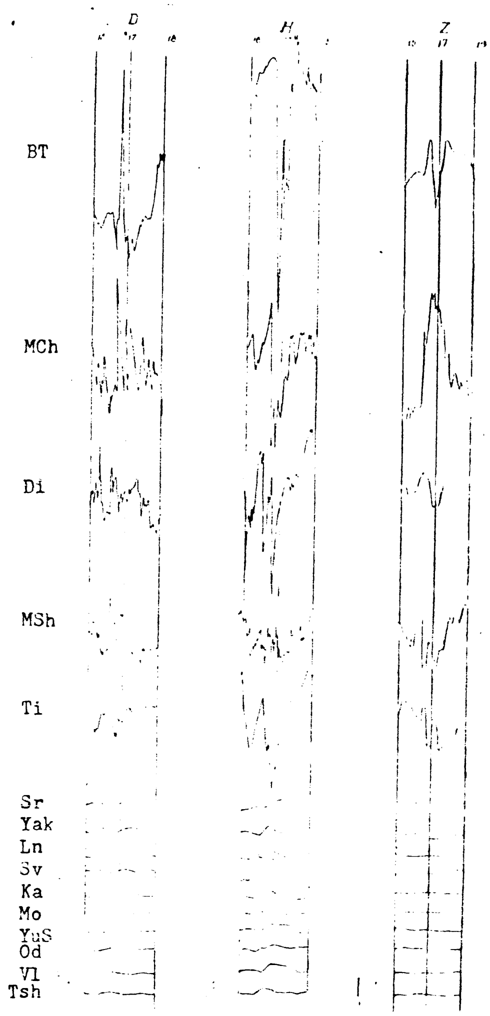


FIGURE 95